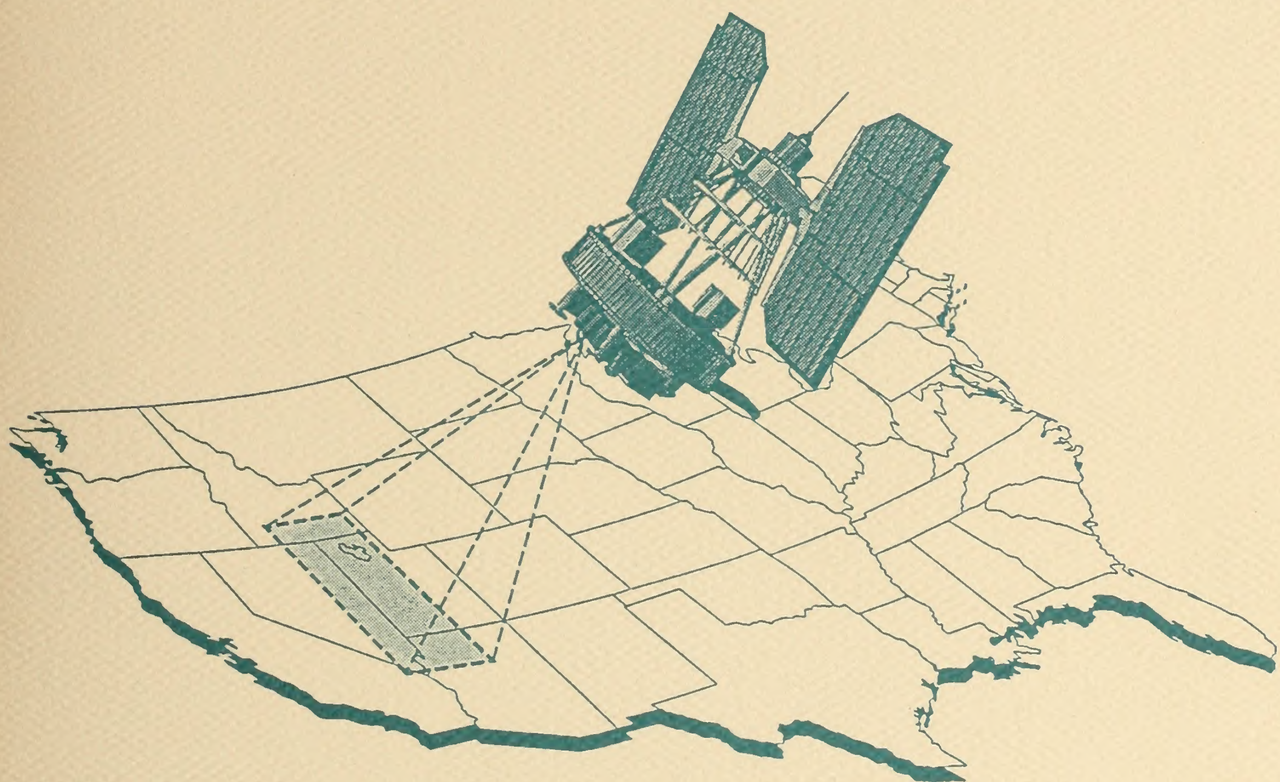
SOUTHWEST INTERTIE PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT
DRAFT PLAN AMENDMENT
DEIS/DPA



Prepared by the:

U.S. Department of the Interior
Bureau of Land Management
Burley, Shoshone, and Boise District Offices, Idaho
Elko, Ely, and Las Vegas District Offices, Nevada
Richfield District Office, Utah

In Cooperation with:

U.S. Department of Agriculture
Forest Service
Intermountain Region, R-4

U.S. Department of Interior
National Park Service
Pacific Northwest, Rocky Mountain, and Western Regions

U.S. Department of Interior
Bureau of Indian Affairs
Cedar City, Utah

U.S. Department of Interior
Bureau of Reclamation
Pacific Northwest, Upper Colorado and Lower Colorado Regions

June 1992

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
BURLEY DISTRICT OFFICE
ROUTE 3, BOX 1
BURLEY IDAHO 83318

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

June 12, 1992

Dear Reviewer:

This Draft Environmental Impact Statement/Draft Plan Amendment (DEIS/DPA) on the proposed Idaho Power Company 500kV Transmission Line, the Southwest Intertie Project, is submitted for your review and comment. The Final Environmental Impact Statement/Proposed Plan Amendment (FEIS/PPA) would be prepared considering comments received. Please retain the DEIS/DPA for future reference as the FEIS/PPA may be abbreviated. The environmentally preferred alternative identified in this document is Route A for the Midpoint to Dry Lake transmission system and the Cutoff Route for the Crosstie transmission system.

Comments on the DEIS/DPA may be submitted in writing or presented verbally at a formal public meeting. As indicated below, six formal public meetings will be held to receive oral comments:

Date	Time	Location
August 3, 1992	7-9 pm	Weston Plaza Twin Falls, Idaho
August 4, 1992	7-9 pm	Wells High School Wells, Nevada
August 5, 1992	7-9 pm	Bristlecome Convention Center Ely, Nevada
August 6, 1992	7-9 pm	City Council Chambers Delta, Utah
August 19, 1992	7-9 pm	Soil Conservation Service Office Caliente, Nevada
August 20, 1992	7-9 pm	BLM District Office

In order to be considered in the FEIS/PPA, all comments must be received or postmarked by September 18, 1992. Please make your comments as specific as possible. Comments providing only opinions or preferences will not have a formal response, but will be included as part of the decision-making process.

A copy of the FEIS/PPA will be sent to all persons, organizations, or agencies who provide comments on the DEIS/DPA,or to anyone requesting a copy. Please address written comments or requests for copies of the DEIS/DPA or FEIS/PPA to:

Karl Simonson
Bureau of Land Management
Burley District Office
Route 3 Box 1
Burley, Idaho 83318

Sincerely yours,

for Norman L. Walker
Gerald L. Quinn
District Manager

COVER SHEET
Southwest Intertie Project
Draft Environmental Impact Statement/Draft Plan Amendment

(X) Draft
( ) Final

(X) Administrative
( ) Legislative

Lead Agency

U.S. Department of Interior
Bureau of Land Management

Cooperating Agencies

U.S. Department of Agriculture
Forest Service

U.S. Department of Interior
Bureau of Reclamation

U.S. Department of Interior
National Park Service

U.S. Department of Interior
Bureau of Indian Affairs

EIS/PA Contact

Comments on this DEIS/DPA Bureau of should be directed to:

Karl Simonson
Bureau of Land Management
Burley District Office
Route 3, Box 1
Burley, Idaho 83318

Copies of the draft have been sent to and comments requested from:
refer to Appendix G

Date DEIS/DPA Mailed to the Public:
June 2, 1992

Date by Which Comments Must Be Received or Postmarked By:
September 18, 1992

Abstract

Idaho Power Company proposes to construct and operate a 500kV transmission line from their Midpoint Substation near Shoshone, Idaho to a new proposed substation in the Dry Lake Valley northeast of Las Vegas. A crosstie route would also be constructed from the Ely, Nevada area to a point near Delta, Utah. New substations would be required near Ely, Las Vegas, and Delta, and series compensation stations would be needed midway between the Midpoint Substation and Ely, Nevada, and between Ely and Dry Lake. New microwave facilities would be required on the route from Midpoint to Dry Lake.

The facilities from Midpoint Substation and Dry Lake would increase the ability to conduct northwest-southwest power exchanges, would increase the capacity and reliability of the interconnected electrical grid in the western U.S., and would enhance competition and economic efficiency of the regional power market. The project would establish an "open-marketplace" for power transfers in the Las Vegas area. Because of the increased capacity to share regional resources, an additional benefit would be deferring new generation facilities and diversifying fuel resources. The crosstie route between Ely, Nevada, and Delta, Utah, would increase the reliability between the existing transmission systems in the Delta area and the planned north-south SWIP system.

Alternatives considered are the no-action, energy conservation, alternative generating sources, alternative transmission systems, alternative transmission technologies, and the proposed action and its eight routing alternatives from Midpoint to Dry Lake and four routing alternatives from Ely to Delta. Routing alternatives include:

Midpoint to Dry Lake Alternatives

- Route A - 345kV*-Thousand Springs-Goshute Valley-Steptoe-Egan Range-Dry Lake Route
- Route B - 345kV*-Trout Creek-Wendover-Steptoe-Antone Pass-Dry Lake Route
- Route C - 345kV*-Trout Creek-Goshute Valley-Steptoe-Egan Range-Dry Lake Route
- Route D - 345kV*-Wells-Steptoe-Egan Range-Dry Lake Route
- Route E - 345kV*-Thousand Springs-Wendover-Steptoe-Egan Range-Dry Lake Route
- Route F - Hagerman-Trout Creek-Goshute Valley-Egan Range-Dry Lake Route
- Route G - 345kV*-Cottonwood Creek-Thousand Springs-Goshute Valley-Steptoe-Egan Range-Dry Lake Route

345kV* parallels Midpoint to Valmy 345kV transmission line

Crosstie Alternatives

- Direct Route
- Cutoff Route
- 230kV Corridor Route
- Southern Route

This Draft Environmental Impact Statement/Draft Plan Amendment (DEIS/DPA) assesses the environmental consequences of the federal approval for the project. Impacts of the proposed action would result from the access roads, tower sites, and staging areas. Impacts are expected to soils, vegetation, wildlife, cultural resources, scenic resources, and land uses. Electric and magnetic effects have also been studied for this project.

State Director
BLM
Idaho

SUMMARY

SUMMARY

Southwest Intertie Project

Idaho Power Company (IPCo) is proposing to construct over 500 miles of single-circuit 500 kilovolt (kV) transmission line between the existing Midpoint Substation near Shoshone, Idaho, and a new proposed substation site in the Dry Lake Valley northeast of Las Vegas, Nevada. The transmission line project, known as the Southwest Intertie Project (SWIP), would be constructed generally using the following tower types:

- V-guyed (or other guyed) steel lattice or self-supporting steel lattice
- steel-pole H-frame in agricultural areas
- self-supporting steel lattice at specific intervals for lateral support

The towers could range from 90-160 feet in height, but would average 120-130 feet. The project would require equipment additions to the Midpoint Substation, a new substation near Ely, Nevada, and a new substation in Dry Lake Valley in southern Nevada. Series compensation stations would be needed to increase the electrical performance of the system northeast of Wells, Nevada, which is about halfway between the two northern substation sites. Another series compensation station may be required in the Delamar Valley in southern Nevada. A new microwave communication system to operate the system would also be required between Midpoint Substation and the proposed substation at Dry Lake.

In the Ely area, another transmission line segment would connect from the proposed substation in this area, east to a new substation near Delta, Utah. This nearly 200-mile portion of the project is referred to as the "Crosstie". This transmission segment would require a new substation near Delta, Utah. An existing communication system between Ely, Nevada, and Delta, Utah would be used with only minor upgrades. If the crosstie is approved, IPCo would transfer the right-of-way grant to the Los Angeles Department of Water and Power (LADWP). The crosstie would be constructed and operated by the LADWP.

Purpose and Need

Electrical utilities have a responsibility to provide adequate supplies of reliable and economical electricity to all classes of customers. Transmission line systems interconnect most states and regions of the West to meet this mandate and to meet increasing demands and seasonal variations in electrical power supply. There is a gap in this system through the inland West. Since 1964 there has been recognition of this shortfall by Congress and utilities throughout the West.

The proposed addition of the Southwest Intertie Project would allow IPCo and other utilities in the Northwest and Southwest to add capacity and reliability to the western electrical system at an economical price. Specifically, the proposed project from Midpoint Substation to Dry Lake would:

- allow for power exchanges from the Northwest to the Southwest
- increase the reliability and capacity of the transmission system in the western U.S.
- increase competition and economic efficiency by increasing transmission access
- allow for mutually beneficial transactions to northwest and southwest utilities at an open marketplace
- increase wheeling capacity for other utilities
- furnish access to the economy energy market
- provide access to long-term purchases and sales
- diversify fuel resources used to generate electrical power

The crosstie route would contribute toward satisfying regional reliability and enhance the electrical grid in the western U.S. by:

- creating a bidirectional transfer path between the Pacific Northwest and the intermountain regions of the West
- creating a bidirectional transfer path between the intermountain region and southern Nevada
- contribute to the reliability of the Utah-Nevada Transmission Project (UNTP) Phase I (Delta to Marketplace line) and the SWIP line from Midpoint Substation to Dry Lake
- allow for the bidirectional transfer of bulk power bought, sold, and/or exchanged in the marketplace between utilities in Utah, southern Nevada, and Idaho

Scoping and Project-Related Studies

Scoping Process

As required by the National Environmental Policy Act (NEPA) of 1969, the United States Department of the Interior (USDI), Bureau of Land Management (BLM), the USDA Forest Service (FS), the USDI Bureau of Reclamation (BOR), and the National Park Service (NPS)

completed numerous scoping activities. Scoping is an information-gathering process open to the public early in a project to identify the range or scope, of issues to address in the ensuing environmental studies. Scoping served to identify significant issues to be analyzed, determine the scope with which they were to be treated in the Draft Environmental Impact Statement/ Draft Plan Amendment (DEIS/DPA), and eliminate issues and alternatives from detailed study, where appropriate. Scoping information provided the basis for identifying alternative routes, and developing the work plan for environmental baseline, impact assessment, and mitigation planning for the project.

Scoping activities included:

- review of previous studies of transmission projects in the area
- completion of a regional siting study, including resource sensitivity analyses, agency contacts, and public scoping meetings
- identification of alternative transmission line routes

A Notice of Intent to prepare a DEIS/DPA for a transmission line project between Midpoint Substation, Ely, Nevada, and Delta, Utah, was published in the Federal Register on March 3, 1989 (Vol. 54, No. 41). Public scoping meetings were held in four communities during March 1989.

In April 1990, the project was expanded to include a route from the Ely, Nevada, area to the Dry Lake Valley area in southern Nevada. A Notice of Intent to expand the scope of the SWIP DEIS/DPA and to tier from the White Pine Power Project EIS was published in the Federal Register on June 4, 1990. Three additional public scoping meetings were held in Las Vegas, Ely, and Caliente, Nevada, during June 1990. A public information meeting was held in Moapa, Nevada, during December 1990 to discuss the ongoing studies in southern Nevada.

Corridor Studies

Alternative transmission line routes were identified based on previous studies, the regional siting study, and public and agency input. Subsequently the environment was inventoried and the data were compiled along all final alternative routes, a total of 21 data layers. This baseline was then used in assessing project-related impacts.

Six public workshops were held in January and April 1991 to report results of environmental studies, present preliminary alternatives, and gain public input regarding the acceptability of those alternatives.

Alternatives Including The Proposed Action

Six general alternatives were evaluated by IPCo to meet its system needs:

- energy conservation and load management
- new generation sources
- alternative transmission systems
- alternative transmission technologies
- proposed action
- no action

The first four of these alternatives were eliminated from further consideration because they did not meet the system requirements or meet the stated purpose and need.

IPCo has developed and implemented numerous energy conservation and load management programs. Conservation, although effective in reducing energy use, cannot be considered an alternative action that would meet the stated need for the project.

IPCo evaluated many alternative generation sources, including hydroelectric, thermal, solar, wind, cogeneration, solid waste, combustion turbine, fluidized bed, and nuclear fusion. These alternatives would not meet the goal of deferring new generation, providing for seasonal exchanges, diversifying fuel resources, and other stated purposes of the project, and therefore, this action was eliminated as an alternative.

IPCo evaluated the feasibility of increasing power purchases from other utilities and wheeling power over the existing transmission system. This alternative was not considered viable because the present system is operated at capacity whenever possible. Any increase in power brought into the system over existing facilities would greatly reduce the reliability of the entire system, reduce the stability of the system, and make outages more frequent and severe.

Alternative transmission technologies (e.g., voltages other than the proposed 500kV, direct current (DC) instead of alternating current (AC), underground construction, microwave, laser, super conductors, etc.) were evaluated. However, these technologies were not considered to be viable alternatives, due to their substantially higher costs, increased environmental impacts, and/or technological unfeasibility.

Advantages of no action would include preclusion of environmental impacts within the project study area and elimination of financial costs associated with construction and operation of a 500kV transmission line. The disadvantages would include environmental, socioeconomic, and electrical service impacts that would result due to other mitigating

actions taken to ensure adequate and affordable energy supplies within the western electrical system.

Proposed Action

IPCo proposes to construct, operate, and maintain a single-circuit, overhead 500kV transmission line between the existing Midpoint Substation near Shoshone, Idaho, and a new proposed substation site in the Dry Lake Valley northeast of Las Vegas, Nevada. The transmission line project would also connect about midway between these two connection points, near Ely, Nevada, east to a new substation near Delta, Utah. The line would be supported by V-guyed and self-supporting steel-lattice, and steel-pole H-frame structures placed an average of 1500 feet apart.

The proposed action would require equipment additions to the Midpoint Substation, one new substation (and possibly a second substation) near Ely, Nevada, a new substation in the Dry Lake Valley in southern Nevada, and a new substation near Delta, Utah. Series compensation stations would be needed to increase the electrical performance of the system northeast of Wells, Nevada, which is about halfway between the two northern substation sites. This series compensation station near Wells may be expanded to accommodate switching equipment (substation). Another series compensation station would be required in the Delamar Valley in southern Nevada.

A new microwave communication system to operate the system would also be required between Midpoint Substation and the proposed substation at Dry Lake. An existing communication system would be used on the transmission line system between Ely, Nevada, and Delta, Utah.

The project is scheduled to begin commercial operation by late 1997. Construction would begin in 1995.

Routing Alternatives

Final routing alternatives for the proposed line were determined through a process of documentation and elimination of alternatives with serious constraints. Alternative routes were eliminated for a number of reasons, including environmental conflicts, public and agency opposition, and system planning/performance criteria.

For routing options remaining, detailed environmental studies were conducted to form the basis for comparing those alternatives. Approximately 2000 miles of alternatives routes were studied in detail. To select routing preferences, the environmental consequences of each route were summarized, based on impact assessment results, environmental resource preferences, and agency and public comments. A network of routes was organized into two major routing alternatives:

- the north-south system from Midpoint Substation south to the Dry Lake Valley
- the "crosstie" routes from Ely, Nevada, to Delta, Utah

Each of these contained several routing options. The final routing alternatives are as follows:

Midpoint Substation to Dry Lake

- **Route A -** 345kV*-Thousand Springs-Goshute Valley-Steptoe-Egan Range-Dry Lake Alternative
- **Route B -** 345kV*-Trout Creek-Wendover-Steptoe-Antone Pass-Dry Lake Alternative
- **Route C -** 345kV*-Trout Creek-Goshute Valley-Steptoe-Egan Range-Dry Lake Alternative
- **Route D -** 345kV*-Wells-Steptoe-Egan Range-Dry Lake Alternative
- **Route E -** 345kV*-Thousand Springs-Wendover-Steptoe-Egan Range-Dry Lake Alternative
- **Route F -** Hagerman-Trout Creek-Goshute Valley-Egan Range-Dry Lake Alternative
- **Route G -** 345kV*-Cottonwood Creek-Thousand Springs-Goshute Valley-Steptoe-Egan Range-Dry Lake Alternative

* parallels the Midpoint to Valmy 345kV transmission line

Crosstie Routes from Ely, Nevada, to Delta, Utah

- Delta Direct Route
- Cutoff Route
- 230kV Corridor Route
- Southern Route

Affected Environment

The climate of eastern Nevada, southern Idaho, and western Utah is influenced largely by location, regional weather systems, and topographic orientation. The climate throughout

much of this area is characterized by hot, dry summers followed by cold, dry winters. Surface winds are channeled through valleys between generally north-south trending mountain ranges. Winds flow predominately in northeasterly or southwesterly directions. Annual precipitation depends largely on elevation. Precipitation occurs primarily in the form of snow at higher elevations during the winter months. The snows maintain high water tables and provide groundwater recharge. Some additional precipitation occurs from thunderstorms produced by daytime heating of air masses in valleys.

Northern segments of the SWIP, within southern Idaho and northeastern Nevada, are in the Snake River Plain section of the Columbia Plateau physiographic province. This section is a vast, relatively flat plain and young lava plateau, which is deeply dissected by the canyons of the Snake River and Salmon Falls Creek, the dominant landscape features within this area. Irrigated agricultural lands, this area's main land use, are found clustered north and south along the Snake River.

To the south, on the Snake River Plain, agricultural areas extend to bordering foothills and mountains in a transitional landscape between the Basin and Range and Columbia Plateau provinces. This transitional landscape includes foothills, plateaus, mesas, and buttes formed of eroded lava and sedimentary rock layers.

The majority of northeastern and southern Nevada and western Utah, falls within the Basin and Range physiographic provinces. Topographically, this landscape is distinguished by isolated, roughly parallel mountain ranges separated by closed (undrained) desert basins or playas. The mountain ranges often run 50 to 75 miles in length and are generally north-south trending. Surrounding the base of the mountains and extending into the basins, there are often distinctive alluvial areas.

Portions of western Utah also include a transition zone of the Basin and Range province into what is locally referred to as the "West Desert" landscape. This landscape includes portions of the Sevier Desert and Sevier Lake. The topography within this area is extremely flat and includes large playas or mud flat areas, that exhibit little landform diversity. Again, these areas are divided by rugged, rocky mountain ranges.

Earth resource features that have a high sensitivity are landslide hazard areas, areas of high paleontological sensitivity, soils with either a high wind erosion or high water erosion hazard, areas of active mining, perennial streams and lakes, springs, and wetland areas. Significant paleontological resources are found at the Hagerman Fossil Beds National Monument near Hagerman, Idaho.

Eleven vegetative communities have been identified in the SWIP study corridors, including shadscale, greasewood, samphire-iodine bush, Great Basin sagebrush, Mojave desert scrub, grassland, wetlands, riparian areas, piñon-juniper, alpine tundra, limber/bristlecone pine, and quaking aspen. These vegetation types support a large variety of mammals, birds, amphibians, and reptiles.

Approximately 560 species of vertebrates are likely to occur, over the course of a year in habitats traversed by the alternative routes.

Seventy species of fish are known to occur within aquatic habitats within the study corridors. Native and introduced game fish are present in warm and cold water lakes, ponds, and reservoirs, and in perennial streams and rivers. Others inhabit hot and cold springs and marshes. Approximately 31 percent of the fish fauna occupying waters within the study corridors are introduced.

Fifteen species of amphibians are expected to occur in aquatic, riparian, and wetland habitats in the study corridors. Sixty-two species of reptiles potentially occur in terrestrial habitats within study corridors.

A total of 111 species of mammals are expected to occur within habitats traversed by alternative routes. Small mammals including rodents, lagomorphs (rabbits and hares), bats, and shrews are the most numerous, although not readily observed. Over one half of the mammals that may occur within the study corridors are rodents (51 species). Large mammals include 19 species of carnivores (e.g., lynx, wolverine, etc.) and five species of native ungulates (e.g., antelope, mule deer, bighorn sheep).

Free roaming horses (Equus caballus) and burros (E. asinus) occur on public lands in the study corridors. These animals are descendants of horses and burros that escaped from man or were turned out onto the open range.

In recent years, dramatic declines in tortoise population numbers have been observed throughout much of its range, including southern Nevada. A number of factors have contributed to the observed decline, including loss of habitat to development, degradation of habitat from livestock grazing, disease, predation on juveniles by ravens attracted to areas where human refuse accumulates, illegal collection, and off-road vehicle (ORV) use. The Mojave population of the desert tortoise was formally listed as a federally threatened species by the U.S. Fish and Wildlife Service (FWS) in April 1990. Concern has been expressed for the maintenance of viable populations in Clark County, Nevada, and especially the Las Vegas Valley where rapid commercial and residential development is occurring.

Declines in sage grouse numbers are largely associated with destruction of sagebrush habitat. Conversion of sagebrush to agricultural lands, and attempts to convert sagebrush areas to grassland for livestock grazing are a few of the human developments contributing to the decrease in grouse numbers.

The majority of the lands crossed by the alternative routes are used for cattle grazing and are classified as rangeland. Other significant uses within the study corridors include agriculture, mining, airports and airstrips, utilities, commercial, governmental and other industrial facilities. Residences near urban areas and in remote locations, both occupied and unoccupied are located within the study corridors. Principal urban areas or residential concentrations in or near the study corridors include

- Hagerman, Eden, and Hansen in Idaho
- Wells, Ely, Curry, Jackpot, and McGill in Nevada
- Delta, Eskdale, and Hinckley in Utah

Several alternative routes in Utah and Nevada could potentially affect military aircraft operations at Hill Air Force Base in Utah and Nellis Air Force Base in southern Nevada.

Approximately half of the lands crossed by the study corridors in Idaho fall into the category of agriculture. The high-desert lands of the Snake River Valley are fertile and productive when irrigated. Many of the lands crossed in Idaho are classified as prime or important farmland by the Soil Conservation Service (SCS).

Dispersed recreation occurs throughout these areas in Nevada, Idaho, and Utah. Developed campsites and recreation areas are usually located along perennial streams or reservoirs. Great Basin National Park, near Baker, Nevada, is passed by several of the alternative crosstie routes. Several wilderness study areas (WSAs) inventoried within the study corridors include portions of Salmon Falls Creek WSA in Idaho and fourteen WSAs in Nevada including South Pequop, Bluebell, Goshute Peak, Goshute Canyon, Marble Canyon, Mt. Grafton, Fortification Range, Delamar Mountains, Evergreen, Meadow Valley Mountains, Fish and Wildlife 1, 2 & 3, and Arrow Canyon. WSAs within Utah include Howell Peak, King Top, Notch Peak, Fish Springs, and Swasey Mountain.

Cultural resources are historic and traditional cultural properties that reflect our nation's heritage. Federal regulations define such historic properties to include prehistoric and historic sites, buildings, structures, districts, and objects included in, or eligible for inclusion in the National Register of Historic Places (NRHP), as well as artifacts, records, and remains related to such properties. These regions of Nevada, Idaho, and Utah have been occupied for thousands of years. This section briefly summarizes what is known about this long history of human use of the region. More details are provided in this document and in the technical reports (Rogge 1991).

Prehistory - The project area overlaps portions of two culture areas, the Great Basin and the Colorado Plateau, but the vast majority of the project area is within the "cultural," if not the geographic, Great Basin. The extreme southern portion is along the western margin of the Colorado Plateau. Within the study area three prehistoric cultural stages, Paleo-Indian, Archaic, and Formative are represented and local phases or variations within each stage have been defined.

Ethnohistory - During the ethnohistoric era, these regions of Nevada, Idaho, and Utah were occupied by the Northern Shoshone, Bannock, Western Shoshone, Pahvant Ute, and Southern Paiute. Generally speaking, the Northern Shoshone and Bannock inhabited the study corridors in southern Idaho. The Western Shoshone ranged through eastern Nevada and Northwestern Utah. The central portion of Utah was occupied by the Pahvant Ute while the Southern Paiute inhabited southwestern Utah and southern Nevada.

History - After the arrival of Europeans in the New World, portions of the study corridors were claimed by Spain, Great Britain, France, Mexico, and Canada, as well as the United States. The earliest European exploration was led by Escalante who skirted the eastern margin of the study area in Utah. After the famous Lewis and Clark Expedition to the Pacific Coast in 1804-1806, fur trappers and mountain men were lured to the Rocky Mountains until the decline of fur trading in about 1840.

Environmental Consequences

The consequences, or impacts, to the environment caused by implementing the proposed project were assessed by considering the existing condition of the environment and the effects of the activities of the proposed project (construction, operation, and maintenance) on the environment. The "initial" impacts were evaluated to determine if mitigation measures would be effective in lessening the impacts. Those impacts remaining after mitigation measures were applied are referred to as "residual" impacts. Many of the identified impacts are considered to be adverse, direct, and long-term. Some impacts (e.g., visual, some cultural and biological impacts) are considered adverse, indirect, and long-term.

The principal type of impacts associated with earth resources is the potential for increased erosion hazards. Some short-term soil compaction impacts could occur in agricultural areas. Some stream sedimentation could also occur at the crossings of perennial streams.

Typical impacts to biological resources include effects on threatened, endangered, or protected species, rare or unique vegetation types, migration corridors for wildlife, areas of low revegetation potential, or highly productive wildlife habitat. The impacts are generally associated with the removal of vegetation and habitat cause by construction and operation activities, and from human activity from more access into remote areas. The presence of the transmission towers would increase the potential for long-term predation of sage grouse by golden eagles on adult and immature birds. Adding towers also would provide roost/hunting sites for ravens and magpies, thus increasing the long-term potential for predation on grouse nests.

Land use impacts include those that would displace, alter, or other physically affect any existing or planned residential, commercial, or industrial use or activity, any agricultural use, or any recreational, preservation, educational, or scientific facility or use. Few land use impacts would occur from the construction of the SWIP, although impacts would be long-term.

Potential socioeconomic effects could include construction-period impacts to area communities, social and economic impacts along the selected route, and fiscal impacts with local jurisdictions. These effects can be both adverse and beneficial.

Visual impacts are considered adverse, direct, and long-term. They include effects to the quality of any scenic resource, the view from any residential or other sensitive land use or travel route, or the view from any recreation, preservation, education, or scientific facility. Visual impacts to existing and proposed sensitive viewpoints for Great Basin National Park is a concern. Other visual impacts are generally associated with residential concentrations or dispersed homes, scenic roads and highways, and recreation viewpoints, including wilderness areas and WSAs.

Direct, adverse physical impacts can occur to cultural resources during construction, while indirect impacts can result after construction due to increased erosion or increased access to sites. Adverse visual effects may occur to sites with high aesthetic or interpretive values.

Potential electrical, biological, health and safety effects from the proposed action were assessed. These include corona effects, electric and magnetic field effects, and effects on cardiac pacemakers, agriculture, and public safety.

The Stateline Resource Area is currently preparing a Resource Management Plan (RMP) which will designate utility corridors. The RMP corridor studies and the SWIP EIS studies have been coordinated, and the preferred alternatives are similar. The Federal Land Policy and Management Act (FLPMA) of 1976 mandates to the extent practical, BLM will consolidate future utility projects within the corridor that is established.

Route Comparisons

The comparative environmental consequences are summarized below for each of the final alternative routes.

Midpoint to Dry Lake Routes

Route A:

- crosses 130 miles within Military Operating Areas (MOAs) of Nellis Air Force Base
- crosses 35.2 miles of sage grouse leks and wintering range
- crosses the most (32.8 miles) bald eagle nesting areas
- most number of residences within one mile
- crosses 52.1 miles of Category I desert tortoise habitat

Route B:

- crosses 182 miles within MOAs of Hill and Nellis Air Force Bases
- crosses 36.8 miles of sage grouse leks and wintering range
- crosses the least (7.2 miles) crucial pronghorn habitat
- impacts to peregrine falcon for 23.1 miles
- least number of residences within one mile
- crosses 52.1 miles of Category I desert tortoise habitat

Route C:

- crosses 130 miles within MOAs of Nellis Air Force Base
- crosses 30.7 miles of sage grouse leks and wintering range
- crosses least BLM-administered lands
- crosses least miles of Visual Resource Management (VRM) Class II landscapes
- crosses 52.1 miles of desert tortoise habitat

Route D:

- crosses 128.4 miles within MOAs of Nellis Air Force Base
- crosses 34.1 miles of sage grouse leks and wintering range
- crosses most miles of riparian areas
- crosses least (6.0 miles) bald eagle nesting areas
- crosses 52.1 miles of desert tortoise habitat

Route E:
- crosses 130 miles within MOAs of Nellis Air Force Base
- crosses 36.3 miles of sage grouse leks and wintering range
- crosses most miles of BLM-administered lands
- impacts to peregrine falcon for 23 miles
- crosses 52.1 miles of desert tortoise habitat

Route F:
- visual impacts to Fossil Bed National Monument
- impacts airstrip used by agricultural spraying operations
- crosses 130 miles within MOAs of Nellis Air Force Base
- crosses 32.8 miles of sage grouse leks and wintering range
- most agricultural lands crossed
- crosses most private land
- most miles within utility corridors
- most cultural sites within one mile
- crosses 52.1 miles of desert tortoise habitat

Route G:
- reduces visual impacts to U.S. Highway 93
- crosses 130 miles within MOAs of Nellis Air Force Base
- crosses 40.6 miles of sage grouse leks and wintering range
- crosses 39.7 miles of crucial pronghorn habitat
- crosses least private land
- crosses 52.1 miles of desert tortoise habitat

Utility:
- reduces visual impacts to U.S. Highway 93
- crosses 130 miles within MOAs of Nellis Air Force Base
- crosses 40.6 miles of sage grouse leks and wintering range
- crosses 39.7 miles of crucial pronghorn habitat
- crosses 52.1 miles of desert tortoise habitat

Agency :
- reduces visual impacts to U.S. Highway 93
- crosses 130 miles within MOAs of Nellis Air Force Base
- crosses 37.2 miles of sage grouse leks and wintering range
- crosses most (43.2 miles) crucial pronghorn habitat
- least prehistoric cultural sites within one mile
- crosses 52.1 miles of desert tortoise habitat

Ely to Delta Routes

Direct Route:
- shortest route and crosses least public and private land
- avoids visual impacts to Great Basin National Park
- crosses wetlands known as the Leland-Harris Spring Complex
- crosses 130 miles within restricted air space and MOAs of Utah Testing and Training Range (UTTR)
- crosses 7.9 miles of sage grouse leks and wintering range
- crosses least miles of crucial pronghorn habitat

Cutoff Route:
- avoids visual impacts to Great Basin National Park
- crosses 104.2 miles within MOAs of UTTR
- crosses 6.8 miles of sage grouse leks and wintering range

230kV Corridor Route
- utilizes existing 230kV corridor
- crosses 102.5 miles within MOAs of UTTR
- crosses 7.1 miles of sage grouse leks and wintering range
- crosses most miles of high water erosion hazard
- crosses most miles (17.8) of bald eagle nesting areas
- highest number of residences within one mile
- highest number of known cultural sites within one mile
- crosses most private and national forest lands
- most miles within utility corridors
- crosses most miles of predicted high sensitivity cultural zones

Southern Route:
- longest route
- highest overall environmental impacts
- crosses least amount of MOAs of UTTR
- crosses 11.8 miles of sage grouse leks and wintering range
- most miles of construction in steep terrain
- crosses most miles of BLM-administered lands
- most miles (85.7) of crucial pronghorn habitat

Preferred Route Selection

Based upon review of potential impact characterizations, significant, unavoidable adverse effects, agency and public comments, and cumulative environmental consequences of the alternative routes, the preferred routes were identified (refer to Identification of Preferred Alternatives in Chapter 2).

Route A is the environmentally preferred route between Midpoint Substation to Dry Lake. The environmentally preferred crosstie route is the Cutoff Route, however, this would depend upon which Ely-area substation is selected. If the Robinson Summit site is chosen over the North Steptoe site, the 230kV Corridor Route would be environmentally preferred.

The agency preferred route between Midpoint Substation to Dry Lake is a combination of Route A and Route G. The agency preferred crosstie route is the 230kV Corridor Route.

IPCo prefers Route G from Midpoint Substation to Dry Lake with several modifications near Contact, Nevada. The utility preferred crosstie route is the 230kV Corridor Route.

The significant, unavoidable adverse effects of this route involve biological, visual, and cultural resources only, as summarized below:

Resource Category	Significant Unavoidable Adverse Impacts
Biological Resources	On the routes between Midpoint Substation and Dry Lake, Route A would potentially disturb 3.2 miles of riparian habitat, 52.1 miles of sensitive desert tortoise habitat, and 35.2 miles of sage grouse leks and wintering range. Route G would potentially disturb 4.8 miles of riparian habitat, a similar disturbance to desert tortoise, and 40.6 miles of sage grouse leks and wintering range. On the crosstie between Ely and Delta, the Cutoff Route would potentially disturb 1.2 miles of riparian habitat and 6.8 miles of sage grouse leks and wintering range. The 230kV Corridor Route would potentially disturb 0.9 miles of riparian habitat and 7.1 miles of sage grouse leks and wintering range. Although the impacts to riparian areas and desert tortoise can be largely mitigated, they are considered significant because of the sensitivity of the resources. The impacts to sage grouse are significant where habitats are crossed where there are no existing transmission lines.
Visual Resources	On the routes between Midpoint Substation and Dry Lake, Route A would potentially result in 13.5 miles of high impacts to the area's visual resources. Significant impacts could be predicted to 83 residences within one mile of the route, and to one scenic highway crossed. The route would cross 7.3 miles of BLM lands managed to retain visual quality (VRM Class II) and FS lands managed to retain visual quality (VQO Retention). Route G would potentially result in 14.7 miles of high impacts to the area's visual resources. Impacts could be predicted to 93 residences within one mile of the route, and to one scenic highway crossed. On the crosstie between Ely and Delta, the Cutoff Route would potentially result in 1.2 miles of high impacts to the area's visual resources. Significant impacts could be predicted to 5 residences within one mile of the route. The 230kV Corridor Route would potentially result in 7.3 miles of high impacts to the area's visual resources. Impacts could be predicted to 26 residences within one mile of the route.

Resource Category	Significant Unavoidable Adverse Impacts
Cultural Resources	On the routes between Midpoint Substation and Dry Lake, Route A would potentially result in 6.8 miles of high impacts to cultural resources. Among the 454 sites identified within one mile, 53 are historic, 13 are ethnohistoric, and 388 are prehistoric. Route G would potentially result in 7.3 miles of high impacts to cultural resources. Among the 474 sites identified within one mile, 61 are historic, 14 are ethnohistoric, and 399 are prehistoric. On the crosstie between Ely and Delta, the Cutoff Route would potentially result in 4.6 miles of high impacts to cultural resources. Among the 39 sites identified within one mile, 5 are historic, 8 are ethnohistoric, and 26 are prehistoric. The 230kV Corridor Route would potentially result in 5.5 miles of high impacts to cultural resources. Among the 100 sites identified within one mile, 12 are historic, 8 are ethnohistoric, and 80 are prehistoric.

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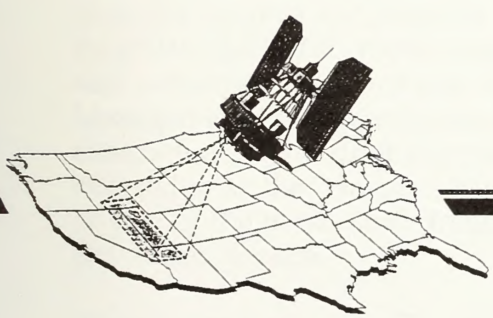

CHAPTER 1

PURPOSE AND NEED FOR ACTION

CHAPTER 1
PURPOSE AND NEED FOR ACTION

INTRODUCTION

High voltage transmission lines have interconnected the states and regions in the West to meet increasing demands and seasonal variations in electric power supply. Within the inland portion of the western United States (U.S.) there are sections of the high voltage transmission system that do not have surplus capacity for additional energy transactions. Congress passed legislation in 1964 that recognized the need for transmission interconnections between states in the Pacific Northwest and states in the Inland Southwest (P.L. 88-552). Later in 1985, the Western Area Power Administration (WAPA) suggested the proposed Southwest Intertie Project (SWIP) corridor as a possible route ("Completing the Pacific Northwest-Southwest Intertie"). In its conclusion, the report said utilities throughout the West recognize that a transmission line built in this corridor would "improve power coordination and overall system reliability, as well as possibilities for more energy transactions which would directly benefit consumers."

The purpose and need of the SWIP is to provide additional transmission capacity and reliability at an economical price between the Northwest and Southwest transmission systems in the western U.S. The seasonal load and resource diversity between electric systems in the North versus those in the South may allow power exchange contracts to replace or defer new resource construction. The additional capacity provided by the SWIP would allow utilities to take advantage of this regional diversity and would promote the efficient utilization of existing power resources.

The SWIP was originally proposed to connect from the existing Midpoint Substation near Shoshone, Idaho, south to a new substation site near Ely, Nevada, then crossing east to a new substation site near the Intermountain Generating Station near Delta, Utah. In early 1990 Idaho Power Company (IPCo) determined that the Utah-Nevada Transmission Project (UNTP) would be fully subscribed and would not be able to provide the transmission capacity for the SWIP to reach the new marketplace substation near Boulder City, Nevada. IPCo decided that the SWIP would have to be extended south from the Ely area in order to meet the purpose and need for the SWIP project to interconnect in the Las Vegas area. In June 1990 the SWIP studies were expanded to include routes from the Ely, Nevada, area to a new substation site northeast of Las Vegas in the Dry Lake Valley. Bureau of Land Management (BLM) determined at that time to retain the Ely, Nevada, to Delta, Utah route alternatives in this draft Environmental Impact Statement (EIS) even though this portion, referred to as the "crosstie", has a separate purpose and need to construct and is not required as part of the north-south transmission segment from Midpoint Substation to Ely, Nevada, to Dry Lake, Nevada.

The crosstie route from Ely, Nevada, to Delta, Utah, would interconnect two electrical utility systems in different geographic areas to establish strategic open marketplace substation

locations and enhance reliability of the interconnected electrical system in the western U.S. The crosstie route was included in this document with the Midpoint to Dry Lake route. Refer to pages 1-4 and 2-31 for additional information on the crosstie route.

The following is a brief description of the project (Chapter 2 provides further detail) followed by a discussion of factors involved in this purpose and need, and a review of planning requirements for the SWIP. All tables are located at the end of the chapter.

IPCo is proposing to construct and operate the SWIP, a high capacity 500,000-volt (500kV) alternating current (AC) transmission line with an initial capacity of 1200 megawatts (MW). The proposed line would extend from IPCo's Midpoint Substation near Shoshone, Idaho, south through Idaho and Nevada to a proposed new substation site approximately 25 miles northeast of Las Vegas, Nevada.

A direct current (DC) system can be an economical alternative to an AC system when a line exceeds 400-500 miles in length with no intermediate substations. The SWIP, however, would provide interconnections to other utilities at intermediate substations and would have the capability to integrate regional generation resources. Such interconnections for a DC system would require construction of expensive converter stations for local AC electricity use.

If approved, IPCo would offer participation, either in ownership rights or nonowner wheeling, to other utilities in the region. IPCo would be the permitting agent for the crosstie portion of the SWIP, but intends to transfer the right-of-way grant to the Los Angeles Department of Water and Power (LADWP), who would construct and operate the facility. This route of approximately 165 miles is also proposed to be constructed from the Ely, Nevada area to the Delta, Utah area. The crosstie route would be rated at 1100 MW.

Typical construction of the transmission line between the Midpoint Substation and Las Vegas would use self-supporting lattice steel structures, self-supporting tubular steel H-frame structures, and steel lattice towers stabilized with guy-wires (refer to Figure 2-2 in Chapter 2). Tower-to-tower spans are anticipated to be approximately 1,000 to 1,500 feet. The towers would range in height from 90 to 160 feet depending on terrain and military airspace considerations, but would average between 120 and 130 feet. IPCo is requesting a 200-foot-wide right-of-way along the route and a separation of 2000 feet between the SWIP and the adjacent high capacity lines that are found in some areas in order to comply with the Western System Coordinating Council (WSCC)[1] reliability and outage criteria (refer to page 2-18). Total mileage of the proposed transmission line is approximately 520 miles.

The proposed line would require an expansion of the Midpoint Substation, a series compensation/switching station near Wells, Nevada, a new substation (and possibly a

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[1] The WSCC is an organization of utilities in the Western United States and Canada, and is one of nine regional councils that make up the North American Electric Reliability Council (NERC). The principal function of NERC is to promote the reliability of the North American electrical system, as well as to provide a forum for the exchange of information and knowledge. On the regional level, the WSCC provides the organizational basis for efficient design and operation of the existing electrical system, as well as a mechanism to insure the future system continues to be reliable and efficient.

second) near Ely, Nevada, a possible series compensation station near Delamar Valley (half-way between Ely and Las Vegas, Nevada), and a new substation near Las Vegas. Expansion of an existing substation, construction of new substations, and series compensation/switching stations would be needed to allow full line capacity and provide control of the transmission system. A microwave system would be constructed paralleling the transmission system to remotely transmit and receive data for protection of the transmission line, and to operate the substations and the switching stations. Of the possible microwave station alternatives, only one would require a new electrical distribution line (less than two miles).

PURPOSE AND NEED

Southwest Intertie Project - Midpoint Substation to Dry Lake

The need for increased power exchanges in the western U.S. is particularly evident between the Northwest and the Southwest. Two main avenues of transmission are now used, the Pacific Interties in the West and various smaller lines around the east side of the Great Salt Lake. The Pacific Interties connect the Pacific Northwest with California. The smaller lines on the east connect the electrical systems of Utah and Colorado to the Southwest states of Arizona and New Mexico. These major paths are presently unable to accommodate the full need for electric power transfers between the northern and southern portions of the western transmission system. Figure 1-1 illustrates the existing regional transmission line network in the western U.S.

Use of the Pacific Interties is governed by Bonneville Power Authority's (BPA) Long Term Intertie Access Policy. This policy allocates use of the interties when demand for those facilities exceeds their capacity. Temporary or short-term, nonfirm access to the interties is based on BPA's determination that capacity is available, and is allocated in proportion to demand. Electric power transmitted on the lines is generally consumed by California utilities with little extra available for transfer to inland southwest utilities.

Use of the eastern transmission path for north-south transfers has historically been difficult. Most of the lines were built to serve specific, localized needs rather than accommodate regional transfers of power. A good example is the Intermountain to Adelanto 500kV DC line that transmits power from the Intermountain Generating Station in Utah to electrical utilities in Southern California. Although stretching from Utah to California, capacity was planned to meet specific needs in Southern California and is limited for bulk north-south transfers of power.

The proposed addition of the SWIP would allow IPCo and other utilities to assist in meeting regional electricity needs by providing economic electricity to consumers and by increasing the overall capacity and reliability of the interconnected electric system between the Northwest and Southwest.

The SWIP would fulfill the major needs as outlined below with further explanation in the following pages.

- Provide for increased power transfer capability between the Northwest and Southwest
- Increase the capacity and reliability of the overall regional power system
- Enhance competition and economic efficiency of the power market
- Establish an "open-marketplace" power transfer location
- Provide power transfer services to nonowners through wheeling
- Allow for additional short-term or spot market purchases and sales of electric power
- Increase long-term, firm commitments for regional purchases and sales of electric power
- Defer new generation facilities and diversify fuel resources

Crosstie Route - Ely, Nevada, to Delta, Utah

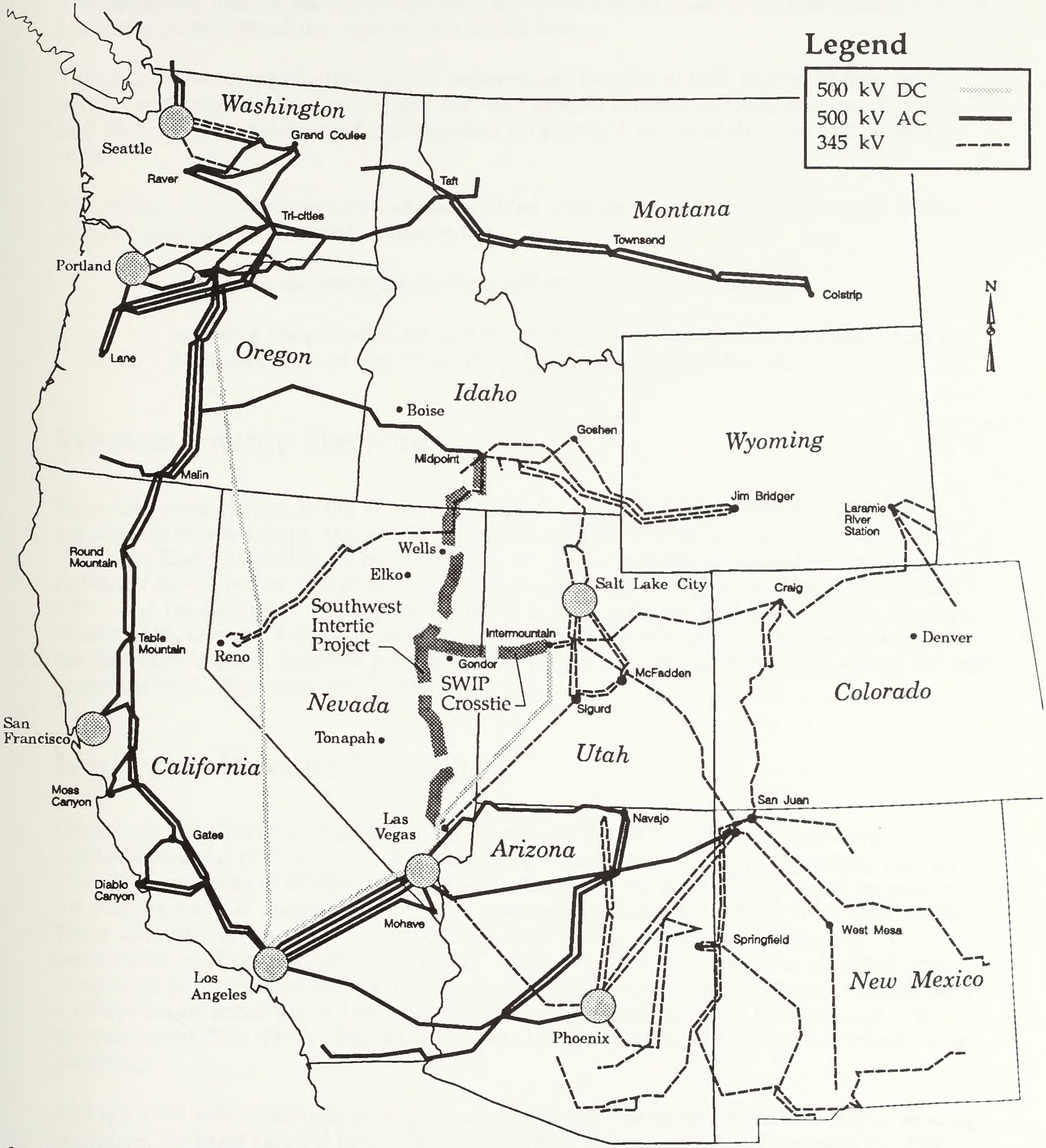
The proposed Utah Nevada Transmission Project (UNTP) would reinforce the interconnected system for Nevada, Utah, Arizona, and Southern California and would be fully subscribed through ownership shares upon completion. The UNTP would provide the initial transmission capacity for the proposed White Pine Power Project (WPPP), possibly support other generation projects, and meet the demand of the UNTP participants for 1100 MW of transferred electricity.

The crosstie route, when interconnected with the Delta-Marketplace portion of the UNTP, and the SWIP would significantly contribute toward satisfying a regional reliability need and enhancement of the electrical grid in the western U.S.

It would create an additional bidirectional transfer path between the Pacific Northwest and the intermountain regions of the West. Currently, these regions are interconnected only by lower voltage transmission lines with limited electric load-carrying capacity.

It would create an additional bidirectional transfer path between the intermountain region and southern Nevada. This is an area that is rapidly growing and is in need of additional energy and capacity resources to serve its native load.

The UNTP Phase I (Delta to Marketplace line) and SWIP (Midpoint to Ely to Las Vegas line), although separate and independent projects, can each improve the other's reliability if the crosstie (Delta to Ely line) is built. In the event of an unscheduled outage on the SWIP or the UNTP, the remaining in-service line would accommodate a portion of the pre-outage load. In addition, some of the power would also flow down other connected AC lines in the area.



Source: Western Systems Coordinating Council Map of Principle Transmission Lines, Jan. 1, 1992

Note: Not to scale

Regional Transmission Network

Figure 1-1

The remaining lines in the immediate area, however, are designed to operate at 345kV which has about 50 percent of the capacity of a 500kV line.

The crosstie route would allow for the bidirectional transfer of bulk power bought, sold, and/or exchanged in the marketplace between utilities situated in Utah, southern Nevada, and Idaho as regional demand and seasonal variations in electrical demand and supply occur.

The crosstie would improve the reliability of the existing Intermountain Generating Station and the interconnected electrical system by:

- increasing the electrical strength and capacity of the system

- reducing the potential for and the severity of the electrical disturbances that can be caused by a variety of events (e.g., storms, earthquakes, etc.).

Western Energy Demand

Electricity consumption in the Western Systems Coordinating Council (WSCC) area is expected to increase approximately 19 percent from 1990 to 2000 according to the North American Electric Reliability Council (NERC 1991). An increasing demand for power is indicated by the return of energy-intensive manufacturing in the Pacific Northwest (Egan 1989), and the setting of record peak demands in 1988 and 1989 in Arizona, Idaho, Nevada, Washington, Oregon, Montana, and Utah. The 1990-2000 annual peak demand growth rate for the entire western region is projected to be 1.5 percent with an annual net energy for load growth rate of 1.8 percent (WSCC 1991).

Northwest Demand Forecasts

Forecasted peak electrical demand in the Northwest Power Pool (power producers in northern Nevada, Utah, Oregon, Washington, Montana, Idaho, western Wyoming, and the Canadian provinces of British Columbia and Alberta) shows an average annual increase of 0.6 percent, and net energy requirement is forecasted to grow 1.7 percent from 1990 to 2000. These estimates are based on net annual electrical energy consumption including transmission and distribution losses (WSCC 1991). Forecast data for seven electrical utility companies in the Northwest of available electric supply versus annual electric demand show a power deficit occurring in 1994-95, with the deficit increasing every year through 1998 (Intercompany Pool 1990). The deficit projected in the Northwest is based on critical water planning.

Reports from individual utilities appear to substantiate this predicted deficit. Using existing resources, Portland General Electric's power surplus is expected to be exhausted by 1992 (PGE 1990) and Pacific Power & Light/Utah Power & Light predict the need for new power sources by 1997 (PPL/UPL 1989). IPCo may need additional resources by 2002 under its

strong economic and load growth scenario (IPCo Resource Plan 1991). Puget Sound Power and Light has issued requests for proposals (RFP) to supply new power capacity by 1993, while the BPA is requesting southern California utilities, who purchase power in the summer, to send power to the Northwest during the winter to meet anticipated shortages.

Some existing hydro resources in the northwest U.S. will be lost when the Canadian Entitlement Purchase Agreement expires. This agreement states that a portion of the power produced by the Northwest hydro facilities belongs to Canada. This share of Canadian energy (1400 MW of capacity) would revert back to British Columbia during the period, 1998-2003. BC Hydro of Western Canada has indicated a desire to "repatriate" the entitlement to meet Canada's future domestic loads. BC Hydro is seeking new sources of power that could be exported to the U.S., but these changes could significantly affect power supplies in the Northwest (Washington State Energy Office 1989).

In the Northwest, demand is generally winter peaking because of the cold weather, while the region's substantial hydro (water) power resources peak in the spring. Regional firm electricity loads are predicted to increase from 19,608 MW in 1991 to 24,254 MW in 2011. In addition, the region currently has 674 MW of short-term firm energy available for sale (Pacific Northwest Utility Coordinating Committee Regional Forecast, 1991). Thus, seasonal exchanges with summer peaking areas provide a market opportunity for the SWIP. Within the Northwest Power Pool (NPP), the winter peak load could exceed the summer peak load by almost 8500 MW in 1992 (NERC 1991). Currently the NPP uses critical water conditions for resource planning. This practice leaves significant surplus generating capacity available in median water years. Buying or exchanging resources from outside of the Northwest during low water years can help avoid or defer construction of new northwest resources, and selling surpluses during high water years can benefit regional utilities through increased revenues and less reliance on higher cost thermal plants. Achieving such benefits would require the sale and purchase of energy and capacity among the northwest utilities and other utilities with complimentary resource bases outside the Northwest.

In the northwest region, IPCo serves electrical consumers in southern Idaho, eastern Oregon and northern Nevada. IPCo currently has about 2500 MW of total peak electrical load and 2600 MW of maximum generation capacity, two thirds of which is hydropower, about one third of which is thermal, and one to three percent of which comes from cogeneration resources (IPCo 1991). The service area peak demand is approximately balanced between winter and summer use with a high summer energy load due to substantial irrigation pumping. During average to better water years, surplus nonfirm energy is typically available. The difference in timing between the hydro resource peak and the summer load peak means IPCo can benefit from exchanges with other areas, particularly southwestern utilities with different resource mixes.

Southwest Demand Forecasts

The Southwest utilities of California, Nevada, Arizona and New Mexico, have a summer peak demand and have the seasonal diversity in energy supply to export electricity to the

North. Southwest utilities also have a broader mix of nuclear, coal, and other energy sources that may help provide diversity to the Northwest.

In a 1990 report, the California Energy Commission projects annual electricity demand growth will be 2.7 percent statewide over the next twenty years. Population increases are expected to account for 75 percent or more of future increases, while increasing per capita energy use accounts for the remainder. The latter includes increased electrical use by the commercial sector that has outpaced recent expectations. Growth in this sector has included the use of more energy-intensive equipment in existing businesses and growth significant to varying building types (California Energy Commission 1990).

The California Energy Commission's analysis of system capacity and energy requirements indicates that statewide existing and committed resources are sufficient to meet electricity needs until 1994. The addition of planned, nondeferrable power supply resources (defined as future cost-effective resources that should be built and should not be replaced by other resource additions) and pending resource additions (supply resources that are planned but do not yet have local, state, or federal regulatory approval) extend the first year of the deficit to 2001. An additional 10,800 MW are necessary to meet needs in 2001 (California Energy Commission 1990).

Out-of-state power purchases have contributed significantly to California's energy supplies for many years and are expected to continue to do so. In 1987, 35 percent of the state's power was provided by imports from the Pacific Northwest, the Desert Southwest (Arizona and New Mexico), Canada, and Mexico. The California Energy Commission reports that the various types of electric power from out-of-state sources is supplied at reasonable cost, and the state's energy needs are compatible with other regions. For example, California's peak energy demands occur during the summer, while the Northwest region's peak period occurs during the winter, which allows California and the Northwest to exchange power at different times of the year without significantly affecting their respective generation capacities. Expansion of transmission capacity, (i.e. the SWIP), would encourage intra- and inter-state electric power competition (California Energy Commission 1990).

The LADWP resource plan is designed to provide an adequate power supply to meet projected electric load growth reliably and economically, provide a sufficient margin to maintain reliability, and to reduce dependence on oil and natural gas as fuels for the generation of electricity. LADWP's resource plan including requests for proposal (RFPs) in 1996 for 100 MW and 600 MW in 2000. A system deficit could be as large as 1500 MW by 2000 without additional resources (CEC 1990).

Nevada has experienced overall population and economic growth, with above-average growth spurts in some economic sectors since 1983-1984. Growth in demand within Sierra Pacific Power Company's (SPPC) service area is forecast by the utility to be 4.5 percent per year through 1994, and 1.6 percent per year from 1994 to 2008. Sharp increases in expected demand are associated with expansion in actual and planned construction of mines in northern Nevada (SPPC 2/1989). The Nevada Power Company (NPC) has experienced peak demand growth from 1983 to 1990 of 7.4 percent, and predicts a moderating 3.0 percent annual growth over the next 20 years depending of the application of demand site management programs. Recent growth in demand has been attributed largely to the rapid

expansion of the hotel-resort industry in southern Nevada, and business relocations to the Las Vegas area (NPC 1991).

Electricity resource plans are prepared by utilities in Nevada every three years. These plans include data on forecasted electric need and available or planned generation capacity. The plans (prior to being finalized) are reviewed by the Nevada Public Service Commission and the State Office of Consumer Advocacy. The resource plan for SPPC shows that power need would increase through 2008/2009, and would have to be met through imported power from other states and capacity additions (SPPC 1989). Under a base case, the 1991 Resource Plan for NPC indicates a total load requirement of just over 2500 MW in 1990, increasing steadily to approximately 5100 MW in 2010. To meet critical resource needs from 1994 to 1999, the system would rely primarily on peaking purchases (NPC 1991).

The Desert Southwest area of Arizona and New Mexico is projected by the WSCC to have a 10-year annual peak demand growth rate from 1990 through 2000 of 2.1 percent (WSCC 1991). Although load growth in the area has averaged 6 percent per year historically, the average annual growth rate for the next decade is projected to be almost 3 percent. This area's highest peak energy use occurs in the summer with an excellent fuel diversity of 22 percent gas- and oil-fired, 46 percent coal-fired, with the remaining percentage a mixture of nuclear, cogeneration, geothermal etc. This provides a good base for developing large exchange transactions with the winter peaking northern areas. Additionally, annual winter peak demand growth is expected to exceed summer peak demand growth in the region over the forecast horizon. This indicates more winter need (NERC 1991).

Capacity and Reliability

The capability for transmitting power to meet changes in electricity demand and supply on a regional or seasonal basis is presently limited by the capacity of available transmission facilities. The SWIP is needed to strengthen the existing transmission system by providing for additional capacity, and allowing for more efficient use of present generating resources between the Northwest and the Southwest on a regional scale. Efficiency would increase by using the different marketing requirements or characteristics of fuel mix, load diversity, and resource development potential discussed later in this document.

Other primary reasons to interconnect transmission systems through the SWIP are to improve system reliability and minimize the effects of generator and transmission failure. It is not unusual for operating units to break down or be out of service for maintenance. A transmission line can also experience outages and need to be disconnected from the rest of the system. It is also common for several transmission lines to be out of service for maintenance at the same time.

The total electrical strength of all ties between the northern and southern portions of the transmission system in the West would significantly increase with the construction of the SWIP. This would reduce the potential for and the severity of electrical disturbances during operating emergencies. Reliability would be increased by providing an additional transmission path between Idaho, Nevada, and Utah. The geographical and electrical

separation between existing north-south transmission facilities and the SWIP would be substantial. This separation would increase system reliability by reducing the portion of all major north-south ties that can be disrupted by a single event, such as an earthquake, storm or vandalism. For example, because both transmission lines would have a similar regional purpose (e.g., to transfer bulk regional power), a separation between the UNTP and the SWIP of 2000 feet is requested, where possible (refer to page 2-18). Separation requirements of these projects are set by the Western System Coordinating Council (WSCC), an organization of utilities throughout the western United States which establishes reliability criteria and the rating of the line (e.g., megawatts of transfer capability).

Reliability also relates to remedial action schemes that are used to minimize the impact of sudden and unexpected loss of critical transmission lines (due to lightning strikes, accidents, etc.). Utilities in the West rely heavily on these complex schemes because of the limited transfer capacity between the north and south subsystems. Unfortunately, because of their complexity and the difficulties associated with fully testing them, the reliability and security of these systems have been a problem. Remedial action schemes have failed on a number of occasions resulting in "black or brown outs" to the consumer, following the loss of heavily loaded transmission lines. In addition, inadvertent operation of some remedial action schemes has caused uncontrolled transmission line outages. Construction of the proposed project would reduce reliance on existing remedial action schemes and may even eliminate several of the more complex schemes. This would improve the overall reliability of the interconnected western transmission system.

Seasonal Exchanges

Firm power purchase and exchange agreements enable IPCo to use power produced by others to meet a portion of its seasonal power supply requirements. Under the provisions of a contract, which would expire in 1997, 108,000 megawatt-hours are exchanged annually with Montana Power Company, with power delivered by IPCo during November, December, January, and February, and received in return during July, August, and September. By a similar agreement ending in 1993, another 108,000 megawatt-hours are exchanged annually with Seattle City Power & Light.

Seasonal power exchanges, or the seasonal purchase and sale of power, are expected to continue beyond 1994 to maximize the annual load carrying capability of existing and future resources. A seasonal exchange, or equivalent purchase and sale, of approximately 370,000 megawatt-hours annually is included in IPCo's base case resource plan starting in 1994. Seasonal exchanges with the current electrical system are not sufficient to meet the stated purpose and need for the project.

Seasonal Diversity

Seasonal diversity is a measure of the seasonal difference in electrical use between two separate regions of the country. For example, electrical demand and consumption in the

inland Desert Southwest is greatest in the summer, as opposed to the Pacific Northwest, where it is greatest in the winter. Based on data published in the WSCC 1990 Summary of Estimated Loads and Resources Report, comparing the three-month average of winter and summer peak loads in the Northwest Power Pool and the Arizona-New Mexico area, almost 3000 MW of seasonal diversity exists. This means that if the two areas were strongly interconnected with transmission, the total resource required to serve the combined load would be almost 3000 MW less than the total resources required to serve the areas individually. However, these two regions of the West are not strongly interconnected, and the existing transmission system between them provides the capacity to exchange 500 to 1000 MW. As a result, there is a minimum of 2000 MW of seasonal exchange potential between the Desert Southwest and the Pacific Northwest that cannot be accommodated by the existing transmission system.

The SWIP, if constructed, would provide participating utilities with the opportunity to exchange both off-peak and peak energy. Exchanged power could flow north in the winter and south in the summer, and enable utilities to defer the construction of new capacity to meet peak demand. Preliminary studies have shown that, in order to serve new load, the cost of the SWIP is less than the cost of new capacity that seasonal exchanges can defer. Hence the SWIP provides a cost effective alternative to the construction of new generating facilities by improving the operational efficiency of the interconnected western electrical system.

Competition and Economic Efficiency

Increased transmission access would create a more competitive market for regional utilities and reduce costs for the eventual retail customer. Additional north-south bulk transmission capacity would relieve limitations and constraints in the existing transmission system as discussed earlier and foster a more active and economically efficient market for the sale and exchange of electric power.

Most state public utility commissions in the West (Nevada, California, Idaho, Utah, Washington, and Oregon) require public utilities to acquire needed resources at the lowest cost consistent with environmental constraints giving full consideration to all available resource options. Such least-cost planning will often lead utilities to purchase power instead of building new generation resources, making extensive use of transmission facilities necessary to carry least-cost power from distant production facilities to load centers.

Related to competition is the short-term and long-term access issues discussed in this purpose and need. The Federal Energy Regulatory Commission (FERC) encourages short-term transmission services at flexible prices to complement a competitive power market. It also maintains that any utility must be able to obtain long-term, firm transmission service for the power market to be competitive.

Open Marketplace

The SWIP would provide firm transmission access to and from an "open marketplace" substation near Las Vegas where northern and southern participants may conduct mutually beneficial commercial power transactions. This location would give individual utilities in the Northwest and Southwest access to an "open marketplace", where commerce can be conducted with fewer restraints of ownership. The open marketplace is a new concept where buyers, sellers, and wheeling utilities are part of a coordinated group that allows them to transact business with each other without burdensome wheeling charges, access policies or other barriers to trade. Power transactions could include energy and capacity purchases, sales, exchanges, reserve sharing, unit maintenance coordination, standby charges, and scheduling charges (FERC 1989).

The new substation in the Dry Lake area would be the southern terminus of the SWIP. In 1990 BLM asked IPCo to help coordinate the transmission needs of utility companies with new transmission facilities planned in southern Nevada, particularly those needing transmission access to the McCullough Substation area located south of Boulder City, Nevada. Subsequent discussions with NPC and other utilities resulted in the Marketplace-Allen Transmission Project (MAT) project being proposed by Nevada Power Company. This approximately 53 mile project would connect the new SWIP substation in the Dry Lake area to a new marketplace substation in the McCullough Substation area. Two high capacity 500kV transmission lines would connect the two substations of the "open marketplace". The combined capacity of over 3000 megawatts would allow utilities to interconnect at either substation and conduct transactions.

The SWIP also proposes to establish an "open marketplace" substation in the Ely, Nevada area to conduct similar power transactions as those described for the Las Vegas area. The crosstie route from the Ely, Nevada area to the Delta, Utah area would also interconnect into this "open marketplace" substation.

FERC is encouraging such innovative concepts as the open marketplace to meet the transmission access challenge without government interference. This approach is also likely to produce more flexibility in the government policies that are adopted (FERC 1989).

Wheeling

Wheeling is the transfer of power from a seller to a buyer over the transmission facilities of a third party. In most cases, wheeling requires a contract with a third party to allow the use of their transmission systems to transmit electricity from the buyer to the seller. Additional transmission capacity between the Northwest and the Southwest would allow participants in the SWIP to transmit power for other utilities, including nonparticipants, as well as enhancing system reliability. This can also provide economic benefits to participants and their retail customers in the form of transmission service revenues. FERC recommends flexible contractual agreements to deal with wheeling arrangements. The SWIP would provide wheeling access.

Economy Purchases and Sales

Economy purchases and sales are short-term, nonfirm transactions that allow the purchasing utility to substitute lower cost energy for displacement of its own higher cost fuel resources. These transactions are scheduled hourly, daily, weekly, or longer. For example, one utility may be generating electricity at a lower cost than its neighbor because it is burning coal instead of the higher priced oil its neighbor is using. Utilities buy and sell electricity in the short-term market to reduce their production costs, which is beneficial to both the utility and its rate-payers.

Utilities attempt to control production costs by reducing the risks of fuel uncertainty through diversification of fuels. Access to surplus northwest hydropower may reduce the risk of uncertain future oil and gas prices for southwest generation. Access to surplus southwest thermal generation could provide northwest utilities with additional resource flexibility during low water years.

Economy may also be gained by short-term transactions for seasonal or daily resource energy exchanges, required power for reserve capacity and emergency power, and flexibility provided in scheduling generator maintenance. California, for instance, must be able to purchase power on the short-term market to avoid dependency on more expensive oil and gas resources.

Long-term Purchases and Sales

In addition to the short-term market, there are long-term firm or stable energy interchange arrangements that may last for months or years. A firm purchase ensures the availability of electricity to meet a buyer's reliability needs. Such transactions serve to optimize or defer plant construction among utilities and further reduce or stabilize costs to customers. Development of new resources requires lengthy lead time periods and forces a utility to accept a set level of energy. A long-term contract allows a utility the flexibility of purchasing an amount of electricity that more closely meets the needs of a utility. Purchasing during the lead times or selling after the acquisition of new resources helps match resources to load and reduces overall cost.

Fuel Resource Diversity

Uncertain oil and gas prices are driving utilities, especially in California, to diversify their use of various fuel resources to generate electrical power. The Powerplant and Industrial Fuel Use Act (PIFUA) of 1978 discourages the use of fuel oil and gas for generating electricity. A significant portion of the approximately 4900 MW total oil- and gas-generated resources available to Southern California Public Power Authority (SCPPA) members could be supplemented by hydropower, coal, nuclear, and other generation resources.

Utilities are also required to produce periodic resource plans to meet future electricity demands. IPCo considers all available resource options and receives regular public input through a Technical Advisory Panel. It then selects reliable options that meet forecast demands at the lowest cost and least environmental impact. Transmission lines offer a feasible alternative to building new resources. A utility can avoid the financial risks associated with the large expense of building new generating facilities, keeping costs down by not constructing new plants and purchasing less expensive energy for its customers.

Lower-cost, nonfirm surplus energy from IPCo or other utilities in the Northwest could permit California and/or southwest utilities to:

- displace a portion of the high-priced oil and natural gas-fired generation
- supply a portion of the project peak load demand energy requirement
- provide for the retirement of obsolete, less efficient, oil-fired generating units
- defer construction of new generating facilities and diversify fuel resources

Access to surplus Southwest thermal generation could provide Northwest utilities with additional resource flexibility during low water years.

SUMMARY

Fulfilling the growing demand for adequate supplies of reliable economical electricity in the western regional system requires a strategy that uses a variety of energy resources that can function quickly and compatibly in a flexible transmission system. As electricity demands rise and costs of building new power plants increase, the ability to exchange power between regions in the West becomes more significant. The seasonal load and resource diversity between electric systems in the North versus those in the South may allow power exchange contracts to replace or defer new resource construction.

PLANNING REQUIREMENTS, ENVIRONMENTAL REVIEW AND LICENSING

Federal regulatory agencies have discretionary authority over the sale of power and the selection and design of new or upgraded transmission facilities. Their review considers the need for power, the pricing rate of power sales and transmission systems, and the environmental consequences of new transmission systems and corridors.

This document is being prepared in compliance with federal guidelines including National Environmental Policy Act (NEPA) and the Council of Environmental Quality Implementation Procedures 40 Code of Federal Regulations (CFR) 1500-1508, criteria developed to guide the plan amendment process in designating right-of-way corridors on Bureau of Land

Management (BLM) lands (43 CFR 2806.2), BLM planning and amendment regulations found in 43 CFR 1600, and the planning and amendment process outlined for Forest Service (FS) lands (36 CFR 219.10 and Forest Service Manual 1920 Interim Directive No. 12). These criteria help set the guidelines and standards for inventory of environmental resource data, assessment of project effects and impacts, selection of routing alternatives, and the BLM and FS plan amendment process. Additional legal guidance for BLM to consolidate utility corridors to the extent practicable is found in the Federal Land Policy and Management Act of 1976 (PL 94-579 Section 503).

BLM would have the most lands affected if the SWIP is constructed and was selected as the federal lead agency to prepare this Environmental Impact Statement. The Forest Service, Bureau of Reclamation, National Park Service, and the Bureau of Indian Affairs would have lands affected by various routing alternatives and are federal cooperating agencies during the EIS process. The federal lead agency, in consultation with the federal cooperating agencies, will select a preferred alternative as outlined in Chapter 2 of this document. After reviewing public comments on the DEIS/DPA, the Idaho State Director will file the FEIS and proposed plan amendment with the Environmental Protection Agency (EPA).

The environmental planning, consultation, and impact assessment processes have been integrated to comply with all applicable federal, state, and local regulations. Table 1-1 outlines the major authorizing actions required for the proposed transmission line to comply with existing law and regulation.

CHAPTER 1

TABLES

TABLE 1-1

Summary of Potential Major Permits Required for Transmission Line Construction and Operation

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit Approval, or Review	Relevant Legislation
FEDERAL				
National Environmental Policy Act (NEPA) Compliance	Granting of ROW Over Land Under Federal Jurisdiction for Implementation of Project	Lead Agencies - BLM; Cooperating Agencies	EIS and Record of Decision	NEPA, Council of Environmental Quality (CEQ). 40 CFR Parts 1500-1508
Right-of-Way (ROW) Over Land Under Federal Management	Construction, Operation, and Abandonment	Bureau of Land Management (BLM)	Grant of ROW and Temporary Use Permit	Federal Land Policy and Management Act of 1976 (P.L. 94-579) USC 1761-1771 and 43 CFR 2800
		Bureau of Indian Affairs	Grant of ROW over Indian Lands	25 CFR 169
		Forest Service (FS)	Special Use Authorization Permit, or Easement	36 CFR 251
		Army Corps of Engineers (COE)	General Easement Required for Installation on COE/Military Land	10 USC 2668, 2669 43 USC 961
		National Park Services (NPS) Lake Mead National Recreation Area (LMNRA)	Authorization to Cross LMNRA Lands	Title 18 USC, 36 CFR 14

Table 1-1 (continued)
Summary of Potential Major Permits Required for Transmission Line Construction and Operation

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit Approval, or Review	Relevant Legislation
FEDERAL (cont.)				
		Fish and Wildlife Service (FWS)	Special Use Permit for Crossing a National Wildlife Refuge	50 CFR 25
		National Park Service	Review of Transmission Line Corridor, to Identify Conflicts with Recreational area Reserved with Monies from the Land and Water Conservation Fund Act	Land and Water Conservation Fund Act P.L. 88-578
	Construction, operation and abandonment of transmission lines across or within highway ROWs	Federal Highway Administration	Permits to cross Federal Aid Highway. Compliance with Section 4 (f) Department of Transportation Act	23 CFR 1.23 and 1.27 and 23 USC Sections 116, 123, 315; (23 CFR Part 645 Subpart B), 23 CFR 771
	Construction Across Water Resources	COE	General Easement	10 USC 2668, 2669
	Streams and Rivers			40 USC 961
	Discharge of Dredge and Fill Material	COE	404 Permit (Individual or Nationwide)	Clean Water Act
	Placement of Structures and Work in Navigable Waters	COE	Section 10 Permit	River and Harbors Act

Table 1-1 (continued)
Summary of Potential Major Permits Required for Transmission Line Construction and Operation

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit Approval, or Review	Relevant Legislation
FEDERAL (cont.)				
	Protection to all Rivers Included in the National Wild and Scenic Rivers Systems	All Federal Agencies	Review by Permitting Agencies	Wild Scenic Rivers Act P.L. 90-542 43 CFR 83.50
Biological Resources	Grant of ROW by Federal Land Management Agency	FWS	Endangered Species Act Compliance by Federal Land Management Agency and Lead Agency	Endangered Species Act, Section 7
	Protection of Migratory Birds		Migratory Bird Treaty Act	16 USC 703-711 50 CFR Ch 1 FR Vol. 40, No. 231
	Grant of ROW by Federal Land Management Agency Involving Aquatic Habitats	Lead Federal Agency	Fish and Wildlife Coordination Act Compliance by Federal Land Management Agency and Lead Agency	Fish and Wildlife Coordination Act
Cultural Resources	Grant of Right-of-Way by Federal Land Management Agency	BLM, FS, State Historic Preservation Officers Advisory Council on Historic Preservation	National Historic Preservation Act Compliance by Federal Land Management Agency and Lead Agency	National Historic Preservation Act of 1966, 36 CFR Part 800 16 USC 47
		All	Protection and Preservation of Native American Religious and Cultural Rights and Practices	American Indian Religious Freedom Act 42 USC 1996

Table 1-1 (continued)
Summary of Potential Major Permits Required for Transmission Line Construction and Operation

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit Approval, or Review	Relevant Legislation
FEDERAL (cont.)				
Cultural Resources (cont.)	Disturbance of graves and associated artifacts	All	Consultation with Native American groups	Native American Grave Protection Act of 1990
		All	Permit for study Historical, Archaeological and Paleontology resources	Antiquities Act of 1906 16 U.S. C. Section 432-433
			Permits to excavate and remove archaeological resources on public and Forest Service lands.	Archaeological Resources Protection Act of 1979 16 USC Sections 470aa-470ii (43 CFR Part 7)
	Protection to segments, sites, and features related to national trails		National Trails System Act	P.L. 90-543 16 USC 1241-1249
Air Traffic	Notice on Location of Towers May Be Required	Federal Aviation Administration	A "No-hazard Declaration" required if structure is more than 200 feet in height	49 USC 1501 14 CFR 77
			Air Space Permit for air space construction clearance	Section 1101 of FAA Act of 1958, 49 USC Section 1501 and (14 CFR Part 77)
Rate Regulation	Sales for Resale and Transmission Services	FERC	Federal Power Act Compliance by Power Seller	Federal Power Act Section 205

Table 1-1 (continued)
Summary of Potential Major Permits Required for Transmission Line Construction and Operation

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit Approval, or Review	Relevant Legislation
State and Local				
NEVADA				
ROW Encroachment	Encroachment into State Roadway ROW	Nevada Department of Transportation	ROW Occupancy Permit	Nevada Revised Statutes (NRS) 408.423
Ground Surface Disturbance	Project Construction	Division of Environ-mental Protection (NDEP)	Registration Certificate	Nevada Administration Code (NAC) 445.704
	Construction of Electric Transmission	Public Service Commission	Authority to Construct and Certificate of Need	NRS 704.330, 704.820, 704,701
Natural and Cultural Resources	Crossing State Lands	Division of State Lands	Easement onto State Lands	NRS 321.001
Air Quality	Construction and Operation	NDEP	Authority to Construct Permit to Operate	NRS 445
Rare and Endangered Plant Species	Modification of Habitat	Division of Forestry	Identification of Plant Species	
Rare and Endangered Animal Species	Protection and Management of Rare and Endangered Species	Nevada Department of Wildlife	Authority to Protect and Manage	NRS 501 NAC 503
T & E Species	Modification of Habitat	Nevada Department of Wildlife	Special Permit	NAC 5-4.510-.550
Clark County	Construction and Operation	Clark County Planning	Conditional Use Permit (payment of impact fees for desert tortoise)	Clark County Zoning Ordinance

Table 1-1 (continued)
Summary of Potential Major Permits Required for Transmission Line Construction and Operation

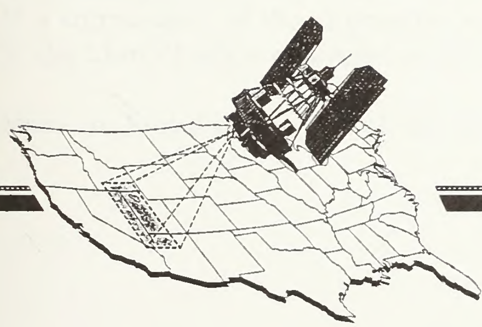
Issue	Action Requiring Permit, Approval, or Review	Agency	Permit Approval, or Review	Relevant Legislation
State and Local (cont.)				
UTAH				
Permitting Process	Proposed Transmission Line Facility	Resource Development Coordinating Committee	Expedites Review of Permitting Process for all State Agencies	UCA 63-28a-5(4)
ROW Encroachment	Encroachment on, through or over State lands	Division of State Lands and Forestry	Application Approval	UCA 65-2-1 et.seq; State of Utah Rules and Regulations Governing the Issuance of Mineral Leases
Ground Surface Disturbance	Project Construction	Public Service Commission	Certificate of Public Convenience and Necessity	UCA 54-4-25
			Approve Construction Contracts	UCA 54-4-25 UAR 750-401
	Crossing State Lands	Division of State Lands and Forestry	Easement onto State Lands. Bond may be required.	UCA 65A-7-12, R632-40-1, 2, and 7
Cultural, Paleontological, and Biological Resources	Crossing State Lands	Division of State Lands and Forestry	Provide a cultural and/or paleontological and/or biological survey and submit procedures for reasonable mitigation actions	R 632-40-4

Table 1-1 (continued)
Summary of Potential Major Permits Required for Transmission Line Construction and Operation

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit Approval, or Review	Relevant Legislation
State and Local (cont.)				
Historical and Cultural Review	Impact on Historical Sites	Division of State History	Notification of Planning Stage and before Construction	UCA 63-18-37
Encroachment on State Park Lands	Utility Easement on State Park Lands	Division of Parks and Recreation	Agreement for Granting and Maintenance of Easements or Rights-of-Way across Park Lands	UCA 63-11-10.3
Air Quality	Construction and Operation	Air Conservation Committee	Air Variance Request through Notice of Intent Letter	UCA 26-13-1
Water Resources	Construction and Operation	Water Pollution Committee	Permit to Operate	UCA 26-11-8 to 26-11-10 and 26-11-16; Code of Wastewater Disposal
Wildlife	Modification of Habitat	Division of Wildlife Resources	Easement for Use of State Wildlife Resource lands	UCA 23-14-1 and 3; 23-21-1
Millard County	Construction and Operation	County Planning, Building and Zoning Commission	Bond for Protection of Roads. Use Permit	Millard County Zoning Ordinances Section 18
Juab County	Construction and Operation	County Commissioners	Conditional Use Permit based on Application and Public Hearing	Juab County Zoning Ordinance
IDAHO				
ROW Encroachment	Encroachment on, through or over State Lands	Department of State Lands	Easement Across State Lands Easement for River Crossings. Temporary Construction Permit	IC Title 58 Chapter 6

Table 1-1 (continued)
Summary of Potential Major Permits Required for Transmission Line Construction and Operation

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit Approval, or Review	Relevant Legislation
State and Local (cont.)				
Ground Surface Disturbance	Construction of Electric Transmission	Public Utilities Commission	Amend Certificate of Public Convenience and Necessity	IC 61-5-26
Water Resources	Crossing Rivers or Streams	Department of Water Resources	Stream Channel Alternation Permit	IC Title 42 Chapter 38
Archaeological Paleontological and Historical Sites	Crossing State Lands	Idaho Historic Society	Permit if crossing archaeological or paleontological sites	IC 67-41-1
			Compliance with other State Laws on graves and caves	IC 27-50-1 IC 18-70-35
Rare and Endangered Animal Species	Protection and Management of Rare and Endangered Species	Idaho Department of Fish and Game	Consultation through other State Agencies	
State Parks and Recreation Land	Crossing such Lands	Idaho Department of Parks and Recreation	Permit Applicable to Specific Use	IC 67-42-12 IDAPA 26-65-43
Gooding Twin Falls Cassia Jerome	Crossing Lands within the County	County Planning and Zoning Departments	Possible conditional or special use permits	County Zoning Ordinances



CHAPTER 2
ALTERNATIVES INCLUDING THE PROPOSED ACTION

CHAPTER 2
ALTERNATIVES INCLUDING THE PROPOSED ACTION

INTRODUCTION

Six general alternatives were evaluated to meet the Southwest Intertie Project (SWIP) needs of providing economical energy to the west and increasing transmission system reliability. These alternatives were:

- energy conservation and load management
- generation
- transmission systems
- transmission technologies
- no action
- the proposed action and alternatives

The first four of these alternatives, discussed in the first nine pages of this chapter, were considered but eliminated because they do not meet the purpose and need for the proposed action. The remaining actions are the no-action alternative and the alternative to construct a transmission line. The no-action alternative, defined as doing nothing to fulfill the purpose and need for the project, is required under the National Environmental Policy Act (NEPA) and implementing Council of Environmental Quality (CEQ) regulation (40 CFR 1500-1508).

The no-action alternative and the proposed action to construct a transmission line are discussed in detail later in this chapter. Transmission lines typically have many alternative routes that can be used to connect into two or more points in the electrical system. Therefore, routing alternatives are identified and compared to determine which route best meets environmental, engineering, and other siting criteria. The following is included in this chapter on the proposed action to build the SWIP:

(1) a description of the proposed action
(2) the process used to evaluate the alternative transmission line corridors
(3) a description of each alternative route
(4) a comparison of the alternative routes
(5) the identification of preferred alternative routes

All tables are found at the end of the chapter.

Alternatives Considered But Eliminated

Energy Conservation and Load Management

Energy conservation is the more efficient use of electricity by customers. Conservation incentive programs are designed to reduce energy consumption per customer, providing an increase in energy resources for new loads. Load management refers to power supply system improvements by a utility. Load management programs allow customer demand to be moved away from peak load hours, freeing existing resources to serve additional peakloads. These resources are the first used to meet customer electricity demands before constructing new power plants or transmission lines.

Energy conservation and load management programs (including state-mandated programs in California) have the advantage of reducing energy consumption without any documented adverse environmental impacts. They have also lowered utility forecasts of electric energy sales and system peak demand.

The following examples of conservation and load management programs are typical of utilities within the Western System Coordination Council (WSCC).

Conservation and load management have been an important part of Idaho Power Company's (IPCo's) strategy for many years and would continue to be stressed in IPCo's resource management program. As much as 20 megawatts of conservation has been documented in previous conservation programs and is reflected in IPCo's current loads. IPCo's load forecast predicts saving 82 annual megawatts in the residential sector and 17 annual megawatts in commercial construction by the year 2010.

The residential sector is the largest single customer on IPCo's system, consuming 31 percent of the retail sales. The Good Cents Program provides builder incentives for new electrically-heated homes. IPCo is also participating in the Low Income Weatherization Program and the House Warming Program in conjunction with state and local agencies. These programs target the weatherizing of low-income homes and energy-use education of occupants. In addition, there are numerous other residential programs that IPCo is actively pursuing, including High Performance Showheads and several demonstration programs.

About 22 percent of IPCo's retail sales are to commercial customers. IPCo has installed over 12,000 water-heater jackets and made payments to customers to purchase over 300,000 energy efficient fluorescent lighting tubes. Since 1982 IPCo has been converting street lights from mercury vapor to the more efficient high pressure sodium. The company has offered computer modeling for energy efficiency in new buildings to architects and engineers through the Design Excellence Award Program. Participation in the program has increased dramatically since 1989. In addition, several other conservation and demonstration projects are in operation.

The industrial and irrigation customers of IPCo represent another 48 percent of the retail electrical sales. These customers are offered demonstration and other incentive programs,

including a low-pressure nozzle payment for irrigators. IPCo is also exploring many other efficiency programs, including conversion of hand/wheel lines to center pivot, water management, small pump, and assisting canal companies. One of the most promising programs is reduction in water use for irrigation, which indirectly would result in a reduction of electricity use.

Electrical generation efficiencies are also part of IPCo's program. At IPCo's Jim Bridger plant, other efforts include installation of new technology together with regularly scheduled maintenance which will increase IPCos' share of plant capacity by 33 MW by 1992. In addition, installation of a computer-based Energy Management System to optimize the dispatch of system hydroelectric and thermal resources is expected to produce an increase in system generation of approximately 17 MW when fully implemented in 1993.

The Los Angeles Department of Water and Power (LADWP) also has active conservation programs. LADWP is currently developing active energy conservation/energy efficiency (C/EE) programs as a means of deferring the need for new generation resources. The current Resource Plan contains preliminary planning estimates indicating that the C/EE programs would result in savings of approximately 600 MW by the year 2000. These estimated savings in LADWP's load forecast could reduce energy consumption by 11.4 percent by the year 2000.

The C/EE program consists of a series of pilot programs including:

- Residential Outreach Program
- Residential New Construction Program
- Existing Non-residential Program
- Commercial/Industrial New Construction Program
- Second Refrigerator Turn-in Program

These pilot programs would determine the economic and energy efficiency of:

- utilizing electric heat pumps and solar/electric systems in new residential construction
- commercial and industrial load management
- streetlight conversion
- voltage reductions
- time-of-use metering
- commercial and apartment surveys
- mastermeter conversion
- single residence and multi-family common-space audits
- water heating
- servicing pool-timer setbacks.

Originally, the Residential Outreach Program conservation service provided home energy audits and other services to residential customers. The auditing program was soon extended to include commerce and industry. LADWP is developing a new program to further extend energy audits and other conservation services to as many as 97,000 small commercial, non-government, and apartment customers.

Although conservation would help reduce LADWP's energy needs, the savings from these C/EE programs are insufficient to be an alternative to the project. The proposed project could be considered an oil-and gas-conservation effort. Firm power would be distributed by the transmission line capacity provided by the proposed project, thereby displacing oil and gas or other types of nonrenewable power generation.

The Salt River Project (SRP) in Phoenix, Arizona, has developed a program, referred to as the Balanced Strategy, which refers to efficient power production and customer-oriented energy conservation. The SRP is actively involved in many new types of energy development, including photovoltaic projects, solar-thermal generation, fuel cells, energy storage, and existing power plant efficiencies.

The customer energy programs are targeted toward cutting the energy costs of power users. Conservation programs are expected to meet about 40 percent of the SRP's projected load growth through the year 2000. The power saved would supply about 50,000 homes in the Phoenix area. These programs include:

- Climate Crafted Homes - energy efficient homes coupled with financial enhancement. This program goal is to have over 4,000 homes in the first year.

- Electric Savings Time - an incentive program that allows low residential and commercial customer rates during low-usage periods. This program expects to have 36,500 customers in four years. In two years each participant would be saving 0.9 kilowatts.

- Power Purchase - cash incentives for replacing old heating and cooling equipment with high-efficiency systems. This program has surpassed its goals, saving nearly 5,000 kilowatts by mid-1991.

- Kilowatch - a self-administered audit program in its pilot stage where homeowners are encouraged to audit their energy consumption and are given ideas on how to save energy and money.

- Direct Load Control - an incentive program where air conditioners and swimming pool pumps can be interrupted during peak demands.

- Energy Efficient Landscaping - low water usage trees placed to provide shade to a home can save significant energy and money.

- Thermal Energy Storage - cash incentives for reducing peak energy consumption during the summer cooling period by freezing special solutions on-site during off-peak hours. The program's 20 participants shift over 8,000 kilowatts from peak loading periods to off-peak hours.

- Energy Efficient Lighting - rebates for use of energy efficient lamps, ballasts, reflectors, and skylights. The goal of this program for the first year is a reduction of 3,500 kilowatts during the peak loading period.

- Energy Partnership - financial incentives for industry to shift power use and cut demand.

Though energy conservation and load management can somewhat reduce energy consumption, they affect energy use and system reliability on a local rather than a regional basis. Therefore, energy conservation plans cannot alone be considered an alternative action to meet the stated need for the project. For this reason energy conservation plans were eliminated from further consideration.

CHAPTER 2

Generation

IPCo and LADWP evaluated a number of alternative generation sources available within the WSCC system (refer to page 2-6 for definition), and, like others in the WSCC, are pursuing the development of hydroelectric, thermal, solar, wind, cogeneration, and small power production. Other alternative generation such as solid waste, combustion turbine, fluidized bed, and nuclear fusion were also evaluated. However, as stated in the purpose and need, this alternative would not defer new generation facilities and diversify fuel resources.

In fact, because of high capital costs and environmental regulations, the lead time required to construct new generating facilities is a lengthy and very risky undertaking. New generation would also require additional transmission although not as lengthy as the proposed SWIP. Finally, generation would meet local but not regional needs for northwest and southwest access and transmission reliability, therefore generation was eliminated from further consideration.

The SWIP, by providing capacity for seasonal exchanges, would encourage the efficient use of existing generation sources by taking advantage of seasonal diversity between the Northwest and the Southwest (also refer to page 1-9).

Alternative Transmission Systems

Existing transmission from the Northwest to the southern markets in California and the Desert Southwest consists of two significant pathways. One is the Pacific AC and DC Interties and the other is on the east side of the WSCC region (refer to Figure 1-1), linking the states of Utah and Colorado with Arizona and New Mexico. The need to transfer power across these paths has often exceeded their capacities. Also, transmission access available to utilities who do not own these paths is quite restrictive.

The Pacific AC Intertie consists of two high-voltage AC lines connecting the northern border of Oregon on the Columbia River to central California. The Pacific DC Intertie consists of one DC line connecting the northern border of Oregon to southern California. In the northwest, Bonneville Power Association (BPA) owns about 85 percent of the Pacific AC and DC Intertie capacity and the rest is owned by Portland General Electric (PGE) and PacifiCorp.

In California, all investor owned utilities, Western Area Power Administration (WAPA), LADWP, and some of the other California public utilities share rights to the Intertie.

Since the Pacific Interties began operation, BPA allowed many Northwest utilities to have access. However, in the early 1980's, demand for access often exceeded capacity and hampered the northwest region's, including BPA's, ability to dispose of surplus power. To enhance its own marketing effort, BPA started developing a Long-Term Intertie Access Policy (LTIAP) in 1984 and adopted interim and near-term policies. In May 1988, BPA finally adopted the LTIAP. The LTIAP allows a very small amount of firm intertie access to the northwest utilities. IPCo's share of firm access is 87 MW, and uses an allocation method to limit other northwest utilities non-firm access to the Intertie. Moreover, LTIAP restricts use of a utility's firm access for nonfirm sales or firm contracts which BPA considers advance arrangements to sell nonfirm energy.

The path in the intermountain region, around the east side of the WSCC region consists of a number of low capacity lines. The WSCC is an organization of utilities in the western U.S. that work together to coordinate the region's electrical system (refer to page 1-2 for a description of the WSCC). The total capacity of the path is quite small compared to the Pacific Intertie and is further limited by a number of transmission "bottlenecks" along the path. A transaction from a northwest utility to the southern market must satisfy all the constraints of each transmission bottleneck it encounters. In addition, most transactions require transmission through several utilities' transmission systems, which often makes the transaction uneconomical.

Because of the reasons described above and intervening utilities' transmission policies, most northwest utilities in the past have not been able to gain firm or nonfirm access to the southern market through the eastern path. Conditions imposed by the Federal Energy Regulatory Commission (FERC), in October 1988 on the PacifiCorp and Utah Power and Light Company (UP&L) merger may improve firm access through the merged company system. However, PacifiCorp's recent filing with FERC shows that only 362 MW of transmission capacity is available between the Northwest and the UP&L system. A part of this capacity would be used by transmission-dependent utilities in the State of Utah, and the remainder could be used by PacifiCorp and other utilities.

A number of new transmission line projects have been discussed in recent years. Of all these proposals, there are only two that are relevant to northwest access to California and the Desert Southwest and are significantly advanced in the planning and permitting processes. These are the Utah-Nevada Transmission Project (UNTP), and the Third AC Intertie Project.

The UNTP is a 500kV transmission line from the existing Intermountain Generating Station, near Delta, Utah, to the McCullough Substation south of Las Vegas. The project is scheduled for completion in 1996. The capacity of the project has not been finalized but is expected to be in the 800 to 1200 MW range.

The UNTP adds new transmission capacity between central Utah and the Las Vegas area. Although the southern terminal of this project provides access to California and the Desert Southwest markets, access to the northern terminal by northwest utilities would remain restricted by less than 300 MW of existing transmission capacity available between the Northwest and the UP&L system.

The Third AC Intertie project is a 500kV project between northern Oregon and the California border. The project would add about 1600 MW of capacity to the Pacific AC Intertie. Like the existing Pacific AC and DC Interties, the project would provide meaningful access only to California, and not the Desert Southwest.

In Oregon, BPA would own and control access to about 85% of the Third AC Intertie capacity. PacifiCorp and PGE would own the remaining capacity. In California all the investor-owned utilities, WAPA, and a number of other utilities would share access on the Intertie.

The Third AC Intertie is presently scheduled for 1993 completion. However, regulatory approvals may delay or substantially change the project. Even if the project is built as it is presently planned, long-term access for northwest utilities (excluding BPA, PGE, and PacifiCorp) to the project is questionable. In December 1988, BPA issued a nonfederal participation in the Third AC Intertie proposal for public comment, but has not yet made a decision to implement it.

In summary, the existing transmission systems do not have adequate capacity to accommodate the transfers of bulk power between the Northwest and Southwest. Because of the insufficient capacity of existing systems, this alternative was not considered acceptable.

Alternative Transmission Technologies

Voltages

The maximum voltage used for major AC transmission lines throughout the western electrical system is 500kV. IPCo chose 500kV for this project because lower voltages would require additional circuits to satisfy the 1200 megawatt rating objective. For example, to achieve this rating for the distance between Midpoint and Dry Lake, three 345kV lines or six 230kV lines would probably be needed.

The use of a higher voltage, such as 765kV, is not practical because voltages higher than 500kV are not used within the western system. In addition, electrical system studies have shown that the electrical benefit of voltages higher than 500kV would not result in higher capacity without significant additional transmission reinforcement. This alternative is not considered acceptable.

Direct Current Transmission

An AC system was selected because it would allow IPCo more flexibility to connect to other systems. IPCo chose not to develop this project as a DC transmission line because the DC terminal installations (e.g., converter stations that convert AC to DC and DC to AC) are more expensive. In addition, there would be considerable difficulty and expense to connect the DC system to intermediate AC buses in the future.

The primary benefit of a DC transmission line system is greater control of power flows. However, this benefit does not justify the considerable increase in project cost (also refer to

CHAPTER 2

page 1-2). The integration of regional resources (existing and future generation or transmission systems) through interconnection is one of the primary reasons for supporting the purpose of this project. A DC line would dictate only two terminals, one at Midpoint Substation and one at Dry Lake Valley northeast of Las Vegas, Nevada, with no intermediate interconnections.

Underground Construction

There has been underground construction of transmission systems in the United States since the late 1920s. Underground construction of transmission lines is commonly used for lower voltage distribution lines in urban areas. However, most high voltage (115kV or above) underground installations have been constructed under constraining circumstances for short distances where overhead lines were not feasible (e.g., in the vicinity of airports, urban centers).

High voltage underground transmission lines have markedly different technological requirements than lower voltage underground distribution lines. Underground high voltage transmission lines require extensive cooling systems to dissipate the heat generated by the transmission of bulk electricity. For this reason, there are currently no underground transmission systems in the U.S. above 230kV longer than approximately 25 miles. Cooling systems are complex and very expensive often employing potentially environmentally hazardous materials (e.g., chloroflourohydrocarbons) as coolant. The extremely high cost of large cooling systems and other special design requirements prohibits the application of underground transmission systems for long distance electric transmission.

In addition, the basic cost of undergrounding a high voltage transmission line would be several times more expensive than the cost of overhead construction. Underground systems would require a pipeline and above-ground ancillary facilities (e.g., oil-pressurizing and pumping stations, cooling stations) to transport cooling oil along the transmission line. Oil-pumping and cooling facilities would be required approximately every 7 to 10 miles along the transmission route and at the originating and terminating substations.

While underground transmission lines are relatively immune to weather conditions, they are vulnerable to washouts, seismic events, cooling system failures, and incidental excavation. Outages for underground lines could last days or weeks while the problem is being located, excavated, and repaired. Typically, failures in overhead lines can be located and repaired in a matter of hours. Long-term outages would be unacceptable for a circuit carrying bulk power. Further, a major cooling system failure could result in coolant spills of environmentally hazardous coolant materials as well as an outage.

During construction, the environmental impacts of an underground transmission line would be similar to those for major pipeline construction. Typical construction would require a continuous trench between terminal points. Potentially greater adverse environmental impacts could be expected because the majority of the right-of-way would be disturbed. Whereas, overhead transmission line construction typically would result only in disturbances at individual tower sites, and at the ancillary facilities, associated with access to the right-of-way.

The principal environmental advantage of undergrounding a transmission line would be the reduction of adverse visual impacts. However, an underground transmission line would still require above-ground ancillary facilities on or adjacent to the right-of-way and would disturb more land area.

In summary, the reduction of adverse visual impacts does not appear to outweigh the costs and potential adverse effects of undergrounding. Because of the technical complications, economic and environmental costs, and accessibility, an underground system was not considered a viable alternative, and was eliminated from further consideration.

CHAPTER 2

New Methods of Transmission

Other methods that might be considered as an alternative for economical bulk-power transmission of electric energy from a generating source to load centers are microwave, laser, and superconductors. Current research and development shows some promising indications that this technology may eventually lead to some viable alternatives to overhead transmission systems. None of these technologies are available for commercial use. Therefore, new methods of transmission were eliminated from further consideration.

Routing Alternatives

This section describes major routing alternatives for the proposed transmission line project that were eliminated from further detailed study during regional scoping and analysis.

From June to December 1988, a regional study was conducted in southern Idaho, northeastern Nevada, and western Utah to determine all reasonable and feasible transmission line routes connecting from Midpoint Substation near Shoshone, Idaho to a new substation site in the Delta, Utah area (also refer to Regional Environmental Study/Scoping Process later in this Chapter and the Objectives, Procedures, and Results Technical Report).

Approximately 3,000 miles of preliminary alternative routes were identified during the regional study. Each of these alternative routes were examined for environmental issues, public acceptability, and engineering constraints. During the scoping process for the SWIP EIS several of these routes were eliminated from further consideration by:

- Environmental constraint analysis based on regional environmental data. The project Steering Committee (also refer to Chapter 5) reviewed environmental data and made recommendations for eliminating routing alternatives. These recommendations were presented to the public in agency review and public scoping meetings during March and April 1989.

- Input from public scoping meetings and public workshops. Public opposition based on acceptability of an alternative or environmental concerns identified by the regional environmental study and by recommendations of the Steering Committee.

In addition, IPCo evaluated the electrical performance of the routes identified in the regional environmental studies. IPCo recommended the routes identified along the Wasatch Front and the extreme eastern edge of the regional study area be eliminated because the route would not meet the project's system requirements of connecting into the Ely, Nevada area and due to the extensive costs associated with the land use conflicts in the Salt Lake City area (refer to SWIP Regional Environmental Study, April 1989).

Because of the length of these alternative corridors, the power expected to flow during normal operating conditions would not justify the line's expense. The extra length of this alternative would cause some of the power expected to flow on this line to use other lines not owned by IPCo. As electricity will always choose the path of least resistance, the length of this alternative would generate much resistance. Under emergency conditions (e.g., when major lines are out of service) the longer route's proportionate share of power typically would be lower than industry guidelines because of resistance.

Figure 2-1 illustrates the potential alternative corridors, including those which were eliminated from further consideration and those that were recommended for detailed evaluation in the DEIS.

ALTERNATIVES STUDIED IN DETAIL

No Action

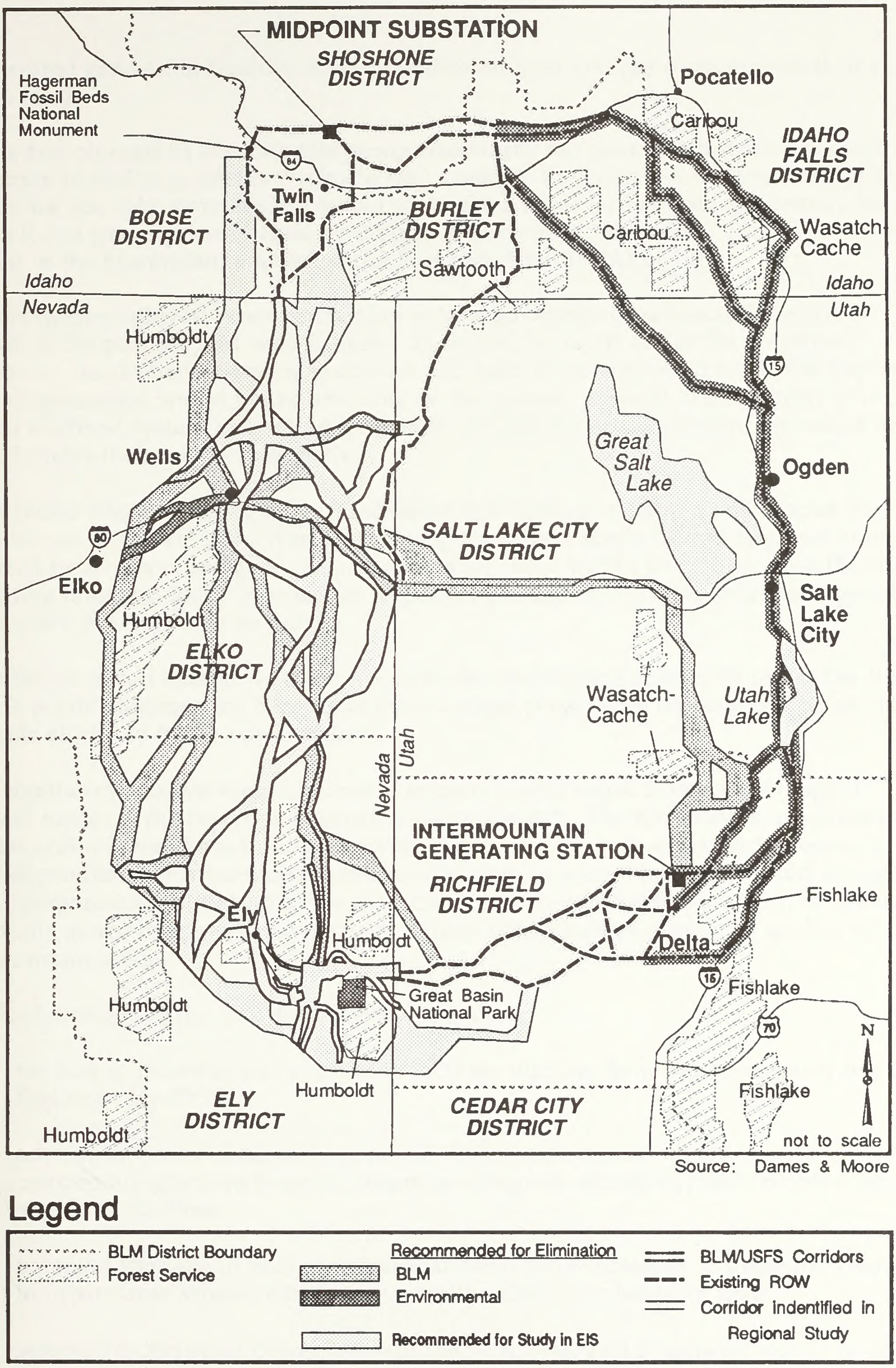
The no-action alternative required for consideration under NEPA regulations has been interpreted in this DEIS/DPA to mean that no new transmission facilities would be constructed by IPCo between the Midpoint Substation and the proposed substation at Dry Lake, nor between a new substation in the Ely area and a new substation near Delta. Under the no-action alternative, the project sponsors would attempt to meet the needs of providing economical energy or anticipated power requirements with existing facilities and fuel sources, along with other measures to compensate for the anticipated shortfall in the supply of electrical power for the region.

Advantages of the no-action alternative would include:

- no adverse environmental impacts from the construction and operation of the SWIP
- eliminating financial costs associated with construction and operation of a 500kV transmission line

However, any monetary savings could be lost through costs to meet the continuing energy needs of the West as outlined in Chapter 1, Purpose and Need.

In an effort to meet forecasted need without new transmission facilities, many western utilities would be forced to continue and likely increase baseload generation from existing oil



Regional Study Corridors

Figure 2-1

and gas-fired generation facilities, thereby maintaining oil and gas consumption at or above present levels.

The gas and oil used to generate this power historically has been much more expensive than the sources of fuel (e.g., coal or hydroelectric) available to generation facilities the SWIP. Oil and gas are not only more expensive fuel sources than coal for baseload generation, but the use of oil and gas as primary fuels by utilities is discouraged by federal energy policy, as outlined in the Powerplant and Industrial Fuel Use Act (PIFUA) of 1978.

The northwest-southwest power exchanges to take advantage of seasonal diversity, as outlined in the purpose and need (Chapter 1), would not occur under the no-action alternative. In addition, economy purchases and sales of power would not occur because nonpeak generation would not be available on the system. Overall, the reliability of the western electrical system that would be gained through the action alternatives would not be realized under the no-action alternative.

The intended effect of adding new transmission is to spread out among more lines the concentration of power flows, thereby reducing the largest single hazard required to be recovered by a reserve margin. The no-action alternative would tend to increase the loading on existing lines and likely increase the largest single hazard requiring more local generation to be on-line in reserve for an outage.

Under the no-action alternative there would be no marketplace substation in the Las Vegas area. It would eliminate the benefits of the proposed project to increase competition and economic efficiency in the power market.

Some significant disadvantages or adverse impacts would result from the shortage in electrical supply if the no-action alternative were selected. The northwest and southwest regional utilities would not be able to diversify fuel sources and, accordingly, reduce its oil or hydro dependency. An interruption to the oil supply or a low water year could seriously affect the sponsors' ability to provide electrical power in their service areas. It is possible that locally generated power may increase, which would lead to greater air quality problems in large urban areas.

The disadvantages of the no-action alternative include:

- the loss of potential tax revenues to local tax districts from project construction and Right-of-Way (ROW)
- adverse environmental, socioeconomic, and electric service impacts resulting from compensating actions taken to ensure an adequate, affordable, and reliable energy supply to the West
- potential shortage of electric power that could force increased locally-generated power in urban areas where compliance under the Clean Air Act is an issue
- seasonal exchange of power between the Northwest and Southwest would be limited by the capacity of existing transmission lines

Proposed Action and Alternatives

Description of Proposed Action

The proposed action for the SWIP is to construct a 500kV AC transmission line from the Midpoint Substation in southern Idaho to a new substation in the Ely, Nevada area and then connecting to a new substation northeast of Las Vegas, Nevada. This EIS evaluates the impacts of several alternative routes (Routes A through G), and compares them (refer to page 2-36 and Chapter 4 for additional information).

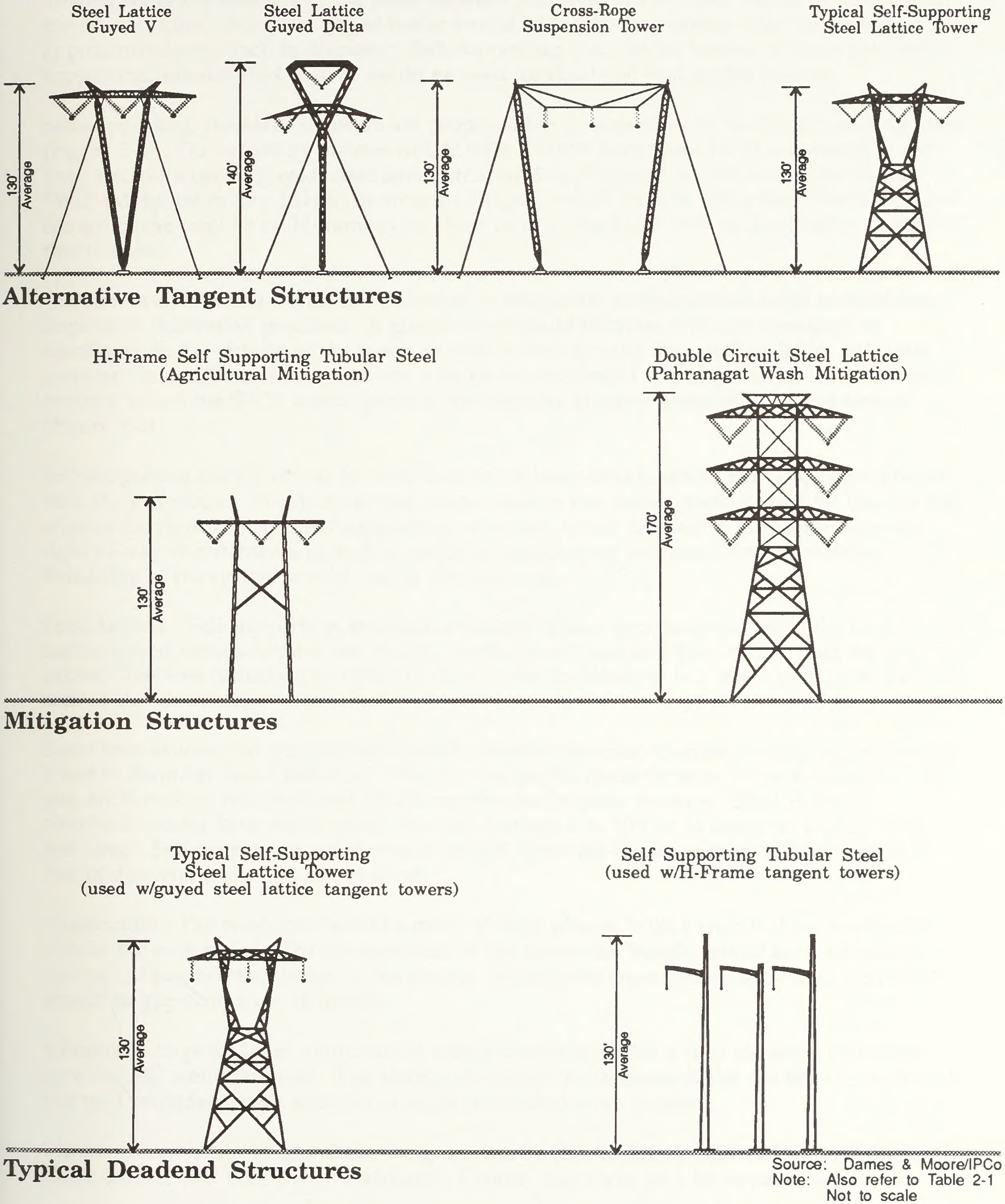
A crosstie 500kV transmission line is also proposed as part of the SWIP to be constructed from the Intermountain Generating Station near Delta, Utah, to the new substation in the Ely, Nevada area. The crosstie line would be constructed and operated by the LADWP (refer to page 2-17). This EIS also evaluates the impacts of several alternative routes for the crosstie (230kV Corridor, Southern, Cutoff, and Direct Routes), and compares them (refer to page 2-46 and Chapter 4 for additional information).

The design, construction, operation, and maintenance of the Southwest Intertie Project 500kV transmission line would meet or exceed the requirements of the National Electrical Safety Code (NESC), U.S. Department of Labor Occupational Safety and Health Standards, and IPCo's requirements for safety and protection of landowners and their property. Table 2-1 contains a list of the basic design characteristics of the proposed transmission facilities.

Transmission Line Design

Towers - The proposed 500kV transmission line would be an AC line interconnecting other regional AC facilities. Proposed tower structures for this transmission line are steel-lattice, self-supporting or guyed steel-lattice towers fabricated from unpainted galvanized steel (Figure 2-2). Self-supporting, tubular-steel structures would be used in agricultural lands to mitigate potential conflicts with cultivation (Figure 2-2). These towers would be fabricated from corten steel (dark, rust-like finish). Typical tower-to-tower spans would average 1,200 to 1,500 feet and tower heights would range between 90 and 160 feet, but would average 120 to 130 feet.

Dead-end towers of self-supporting, steel-lattice design would be required periodically to add longitudinal strength along the line (Figure 2-2). Dead-end towers are also used at many turn (angle) locations along the line, at heavily loaded tower locations, and at specific utility crossings (e.g., other transmission lines) for added safety. A three-pole, self-supporting, tubular-steel tower design is an alternative tower type for use as dead-ends (Figure 2-2). The remaining towers would be tangent suspension or angle suspension towers. Angle suspension towers are of the same basic configuration as tangent suspension towers, the difference being in the insulator systems and tower weights.



Midpoint to Dry Lake Structures

Figure 2-2

Towers along the majority of the route between Midpoint to Dry Lake would be steel-lattice, guyed structures. A typical guyed tower would have four guy cables. Guy cables would be approximately one inch in diameter. Self-supporting, steel-lattice towers or three-pole, self-supporting, tubular-steel towers would be used for dead-end and angles towers.

Self-supporting, steel-lattice towers are proposed for all structures in the Ely to Delta segment (Figure 2-3). The reliability policies of LADWP, a SWIP participant for this segment of the line, precludes use of guyed, steel-lattice structures as proposed for the remainder of the SWIP (Midpoint to Dry Lake). In order to mitigate visual impacts along the crosstie, some of the structures may be an H-frame type. Also refer to the Right-of-Way Acquisition section of this volume.

Tubular-steel, H-frame towers are proposed as mitigation in agricultural lands to minimize impacts to cultivation practices. A guyed tower could interfere with the operation of machinery in the vicinity of the tower as well as with gravity flow and sprinkler irrigation systems. In addition, H-frame towers may be recommended as mitigation to reduce visual contrast where the SWIP would parallel other similar H-frame transmission lines towers (Figure 2-2).

Self-supporting towers would be used in areas of steep terrain where side slopes are greater than the guy slope. This decision was made because guy cables could extend far beyond the edge of the right-of-way. Self-supporting structures would be used to eliminate excessive right-of-way requirements as well as potential construction and operational problems. Reliability of the system would also be strengthened.

Foundations - Self-supporting, steel-lattice towers require four footings, while the steel-lattice, guyed towers require one footing for the tower base and four anchor rods for guy cables. The area disturbed by either of these tower foundations is a small portion of the total area of the tower site.

Some foundations and guy anchors would consist of pre-cast concrete footings approximately 4 feet in diameter and 6 feet deep. Due to site specific characteristics, some foundations and guy anchors (e.g., rock anchors) would require cast-in-place footings. Steel H-frame structures would have cast-in-place concrete footings 6 to 10 feet in diameter and 20 to 30 feet deep. Self-supporting lattice towers would have cast-in-place concrete footings 3 to 4 feet in diameter and 12 to 24 feet deep.

Conductors - The conductor would consist of three phases, with a two or three-conductor bundle for each phase. The configuration of the conductor bundle would be determined during the engineering design of the project. Spacing between subconductors in a bundle would be approximately 18 inches.

Aluminum-trapezoidal or aluminum-stranded conductors with a steel stranded reinforced core (ACSR) would be used. The aluminum carries the majority of the electrical current and the steel provides tensile strength to support the aluminum strands.

Minimum conductor height above the ground is 31 feet, based on National Electric Safety Code (NESC) and IPCo's own standards. Greater clearances may be required in areas

accessible to vehicles. Minimum conductor clearance would dictate the exact height of each tower based on topography and safety clearance requirements. Minimum conductor clearances in some instances may be greater based on specific NESC requirements.

Insulators and Associated Hardware - Three assemblies of insulators in the form of a "V" or an "I" would be used to position and support each of the conductor bundles relative to the tower while maintaining electrical design clearances between the conductors and the tower (refer to Figures 2-2 and 2-3). Each "I" string would consist of 26 to 30 insulators, while each leg of "V" strings would consist of 26 to 30 insulators. Insulator assemblies would be between 14 and 20 feet long.

Overhead Ground Wires (Shield Wires) - To protect conductors from direct lightning strikes, two overhead ground wires, 3/8 to 1/2 inch in diameter, would be installed on the top of the towers. Electrical current from lightning strikes would be transferred through the groundwires and structures into the ground. Ground wire having fiber optic capability may be installed rather than traditional groundwire in order to facilitate project communication needs or potentially to serve the needs of commercial communication companies.

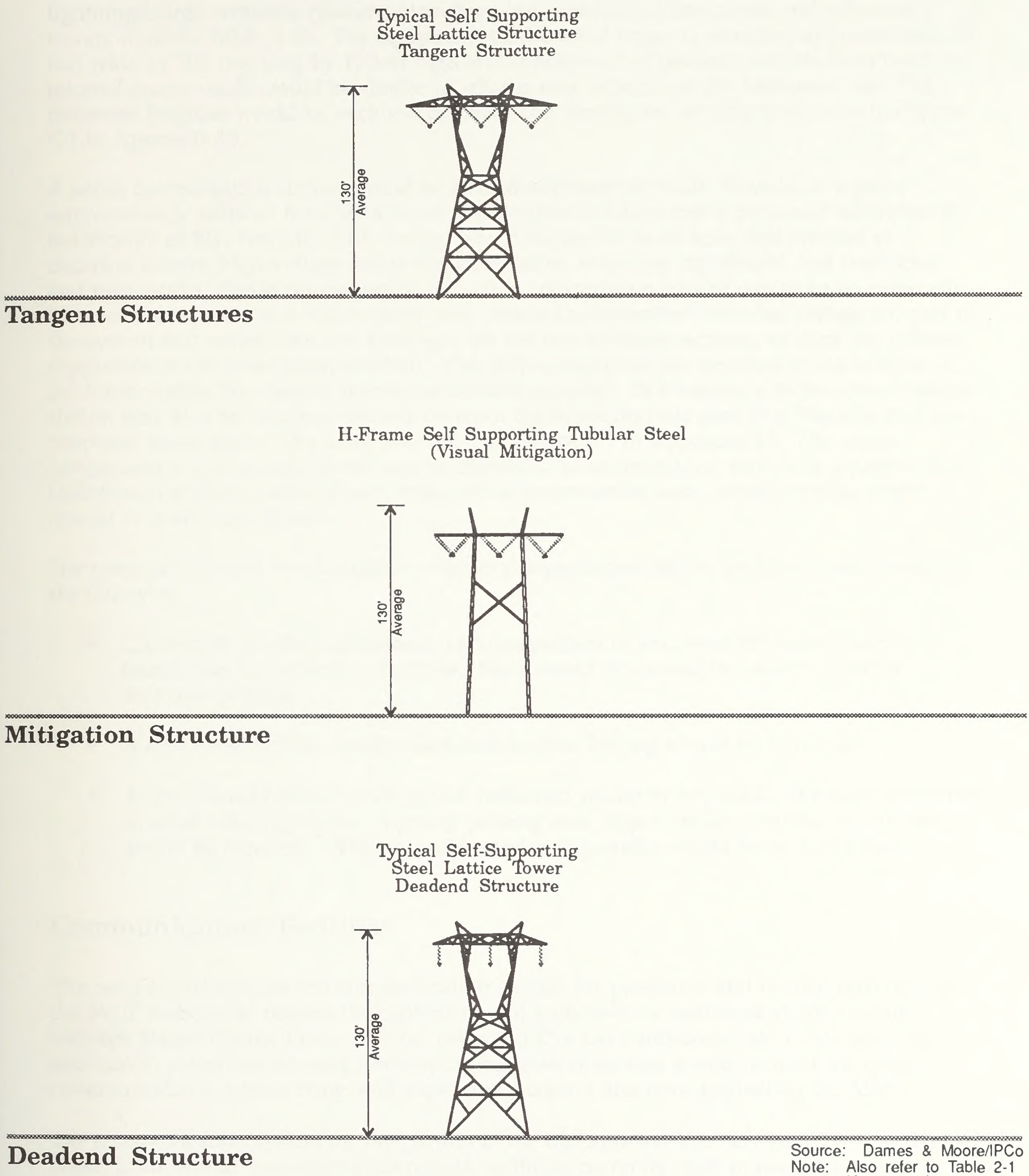
Terminals and Communications

The transmission line originates at the Midpoint Substation in Idaho. New terminals, or substations, are proposed in the vicinity of Ely, Nevada, and northeast of Las Vegas, Nevada. A third terminal may also be needed north of Wells, Nevada for an interconnection with Sierra Pacific Power (SPP). In the past, Sierra (SPP) has expressed an interest in a connection in this location. A substation is also proposed on the crosstie route in the vicinity of Delta, Utah. Substations provide the point interconnection with other transmission lines of the same or different voltages. These terminals would also operate as switching stations where power flows can be controlled. Control of power flows and other operations at substations are generally directed remotely through a microwave communications system. This section describes the types of facilities that are proposed as part of the SWIP.

Substation and Series Compensation Stations

Three new substations would be required in Nevada, one north of Wells, one in the vicinity of Ely, and one northeast of Las Vegas. One new substation would also be required on the crosstie route in the vicinity of Delta, Utah. The land requirements for each substation site would be approximately 80 acres depending on layout of associated electrical equipment, and potential allowance for setbacks from or relocation of existing electric and gas transmission lines.

The electrical towers and rack structures would be similar in appearance and height to those at the existing substation site at Midpoint Substation in Idaho. The maximum height of structures in a substation would be approximately 125 feet. The electrical equipment yards would be open and would include transformers, circuit breakers, disconnect switches,



Source: Dames & Moore/IPCo
Note: Also refer to Table 2-1
Not to scale

Ely to Delta Structures

lightning/surge arresters, reactors, capacitors, bus (conductor) structures, and microwave towers (refer to Table 2-2). The equipment yard control house (a structure approximately 50 feet wide by 100 feet long by 10 feet high and constructed of painted concrete block) and the internal access roads would be similar to what is now existing on the Midpoint site. The proposed facilities would be enclosed by chain-link fencing for security (also refer to Figure E-1 in Appendix E).

A series compensation station would be located northeast of Wells, Nevada, at a point approximately halfway between Midpoint Substation in Idaho and a proposed substation in the vicinity of Ely, Nevada. This facility would require 15 to 20 acres and consists of electrical towers, high-voltage series capacitor banks, switching equipment, bus conductor, and microwave. Series compensation is used in transmission system design to economically increase the capacity of a transmission line. Series compensation provides voltage support to the system that varies with line loadings. As the line loadings increase, so does the voltage support from the series compensation. This action improves the electrical characteristics of the transmission line thereby increasing the line capacity. In addition, a series compensation station may also be required halfway between the substation site near Ely, Nevada, and the proposed substation at Dry Lake (also refer to Figure E-1 in Appendix E). The series compensation station near Wells may be expanded to accommodate switching equipment (substation) if Sierra Pacific Power constructs a transmission interconnection from north central or northwest Nevada.

Site preparation work for substation or series compensation station facilities would involve the following.

- Cut-and-fill grading, placement, and compaction of structural fill would serve as a foundation for substation facilities. Sites would be graded to maintain current drainage patterns.

- A new construction entrance and construction fencing would be provided.

- Approximately 20-foot-wide gravel base road would be required. The yards would be covered with aggregate. A gravel parking area, approximately 100 feet by 100 feet, would be required. Where possible, native vegetation would be re-established.

Communications Facilities

The need for reliable, secure communication circuits for protective and control relaying for the SWIP line would require the construction of a microwave communications system between Hansen Butte, Idaho, and the proposed Dry Lake substation site in Nevada. In addition to protective relaying circuits, the microwave system would be used for voice communications, telemetering, and supervisory control and data acquisition (SCADA).

The communication system for the portion of the transmission line between Ely, Nevada, and Delta, Utah, would use existing microwave facilities, currently used to control the existing 230kV system. The existing facilities would require some modifications (e.g., new

equipment) at each site. However, these modifications are not expected to require any ground disturbing activities.

Ideally, sites chosen for microwave installations are proposed to be 35 to 40 miles apart, have line-of-sight between adjacent sites, have commercial power, and be accessible by road. Where feasible, developed communication sites would be used. In areas where no existing facilities are present and there is no existing access to a viable site, solar powered facilities would be placed and maintained by helicopter. These communications facilities would be unmanned and would operate automatically. The building would be locked and secured, with entry restricted to appropriate utility personnel.

The proposed microwave facilities would require a small site, approximately one-quarter acre in size. Each site would require clearing, and minor grading. Structures on each site would include a 10 feet by 12 feet building made of wood or concrete panels that would be painted an earth tone color to reduce visual contrast. In addition a triangular steel lattice tower ranging between 20 feet and 100 feet in height would be required. Figure F-1 in Appendix F illustrates a typical microwave facility.

These facilities are unmanned and operate by automatically responding to incoming signals. Communication signals are relayed using parabolic (bowl shaped) dishes mounted on the tower which capture signals from other microwave sites and relay them to other sites along the system. The signals are short wave length, high frequency radio beams that maintain good reliability under adverse conditions.

Where there are existing facilities, often only an additional parabolic dish would be needed. For undeveloped sites, the specific type of facility would be determined by the availability of access and proximity to a power supply. If the site is remote and no roads are present, a solar powered facility would be proposed (refer to Figure F-2 in Appendix F). Construction of remote sites would be completed using a helicopter. Where access is near an existing road and/or power supply, a standard facility would be constructed. Most sites would generally be accessible by gravel roads and could be patrolled periodically by IPCo representatives.

Maintenance of the communication facilities would consist of testing, repair, and replacement of electronic equipment located within the building at the communication site. Inspection and maintenance of the building, communication tower, and other physical equipment would occur periodically.

At the end of the proposed project life and if the facilities were no longer required for other existing or proposed projects, the microwave sites would be abandoned (also refer the discussion of site reclamation and abandonment on pages 2-23 and 2-24). Subsequently, the equipment would be dismantled and removed from the sites. Refer to Appendix F for additional information and the Map Volume for the mapped locations of the alternative communication sites.

It is possible that a fiber optic groundwire may be installed (on the towers in place of the shield wire) to facilitate communication needs for the transmission line, or capacity may be sold to commercial communication companies. If fiber access is allowed to commercial companies, they would be responsible for obtaining the necessary permits and right-of-way

needed for regeneration stations at intervals along the transmission line (also refer to Right-of-Way Acquisition).

Right-of-Way Acquisition

In general, new land rights would be required for the transmission line facilities, such as the transmission line corridor, substation/switching stations, series compensation stations, microwave facilities, and access roads (e.g., right-of-way grant, easements, and fee simple). IPCo would request a right-of-way grant from the BLM and a special use permit from the FS for transmission line facilities located on federal lands. Additional right-of-way may be required in isolated areas where the proposed transmission line turns sharply.

Rights-of-way for transmission line facilities on nonfederal lands would be obtained in perpetual easements. If necessary, private lands for substations would be purchased in fee simple. Every effort would be made to purchase all the land rights on private lands through reasonable negotiations with the present owners.

Land rights would be obtained in the name of IPCo. IPCo plans to construct the transmission segments from Midpoint Substation to the proposed substation at Dry Lake in southern Nevada. IPCo has entered into an agreement with LADWP to convey the portion of a right-of-way grant for the segment from the Ely area to Delta. This is referred to as the "Delta Grant" in the agreement. The agreement further states that IPCo would conduct the necessary environmental permitting for the Delta Grant and then assign it to LADWP for construction, operation, and maintenance.

If a route is selected that crosses the Moapa River Indian Reservation (Links 760 and 770), negotiations with the Tribal Council of the Moapa Band of the Paiute for a perpetual easement would be initiated.

If a fiber optic groundwire is installed and access is sold to a commercial company, they would be responsible for all permitting activities and obtaining right-of-way for the regeneration stations that would be needed at intervals along the transmission line right-of-way (also refer to Communication Facilities).

Right-of-Way Separation

Where the SWIP would parallel the proposed Utah-Nevada Transmission Project (UNTP) south of the Delamar Valley, the right-of-ways of the SWIP and UNTP would need sufficient separation to meet reliability and outage criteria of the WSCC (also refer to page 1-2). Without adequate separation, the criteria considers the simultaneous outage of the SWIP and UNTP to be a credible event, or an event that has a significant likelihood of occurring. The simultaneous loss of the SWIP and UNTP under heavy transfer conditions could precipitate a major electrical system disturbance resulting in a cascading failure of the western power

CHAPTER 2

system. Building and operating the system in this manner would be inconsistent with the WSCC Reliability Criteria.

Therefore, the projects must (1) reduce capacity (which has the effect of rendering one project economically impractical), (2) provide measures to avert system breakup (considered technically and economically impractical), or (3) construct the projects so a simultaneous outage is not credible (use adequate circuit separation). While the latter course is preferable to the project participants, the specific amount of separation required to achieve this determination has not been defined in the criteria. However, based on the terrain and environmental considerations in the area of parallel right-of-way, it is believed that 2,000 feet would be adequate. Double circuit towers or a separation of less than 1000' would exist in isolated areas along the route due to terrain or land use conflicts. It is believed that by using a higher safety factor on the tower design in these physically constrained areas. the reliability would be sufficient to maintain the requested capacity rating. Also refer to Corridor Studies (page 2-28) and Capacity and Reliability (page 1-8).

The SWIP and UNTP would converge near Robber's Roost Hills (Link 675), and would travel parallel for approximately 140 miles (Links 690, 700, and 720) into Coyote Spring Valley in southern Nevada, where the UNTP would continue south and the SWIP would cross through the southern end of the Arrow Canyon Range into the Dry Lake Valley. Separation of 2,000 feet is needed for this entire distance except where it is not physically possible to maintain this separation.

In the Pahranagat Wash area, the SWIP and UNTP lines may need to be closer for two miles or more. Because the Delamar Mountains and Evergreen Wilderness Study Areas (WSAs) are within about 1/2 mile of each other and other linear features are present (e.g., U.S. Highway 93 and the Lincoln County Coop 69kV line), the SWIP and UNTP lines would be constructed on double circuit towers, each with an open circuit. The SWIP line is proposed to be on the west side and the UNTP on the east. The plan is for the two future WPPP lines to be placed on the open circuits of the SWIP and UNTP lines through this area. The proposed configuration of the planned lines through this area is shown schematically in the cross-sections included in the Map Volume. To help compensate for this lack of separation and to meet the WSCC criteria outlined above, the structures within this area would need to be engineered to a higher standard to better withstand potential physical disturbances (e.g., earthquakes, etc.). Also refer to Cumulative Effects section in Chapter 4.

If the Delamar and Evergreen WSAs are not designated as Wilderness by Congress by the time all of the lines are constructed, the involved utilities may pursue amending the right-of-way grants to allow all of the lines to be placed on separate circuits.

In the approximately 140 miles where the SWIP and UNTP lines can be separated by 2000 feet, the SWIP and UNTP lines would form the outside edges of the utility corridor that would include the two planned 500kV WPPP transmission lines. The cross-sections in the Map Volume schematically show the relationship of the four planned 500kV transmission facilities. Also refer to the Cumulative Effects section in Chapter 4.

In areas where the SWIP would parallel lower voltage overhead lines, a minimum separation of 200 feet, centerline to centerline, would be required. With this separation, if either the SWIP or the lower voltage line failed, neither would fall into the other.

Construction

Construction of a transmission line follows the sequence of surveying the centerline, access road identification and construction, right-of-way and tower sites clearing (including construction yards and batch plants), installing foundations, assembling and erecting the towers, clearing, pulling, tensioning, and splicing sites, installing ground wires and conductors, installing counterpoise/ground rods, and cleanup and site reclamation. Various phases of construction would occur at different locations throughout the construction process. This would require several contractors operating at the same time in different locations.

Surveying Activities - Before construction surveying begins, it would be necessary to obtain either a survey permit on federal and state lands, or rights-of-entry for private lands. Construction survey work would consist of locating the centerline, tower center hubs, right-of-way boundaries, and tower access roads. All of these activities would begin approximately two years prior to the start of construction. Cultural resources and threatened and endangered species intensive surveys can begin once the survey of the centerline and access roads is completed and clearly marked.

Access Road Construction - The construction, operation, and maintenance of the proposed transmission line would require that heavy vehicles access tower sites along the right-of-way. If new access roads are required, they would be constructed to support the weight of these vehicles. Where necessary, temporary roads would be typically 14 feet wide bladed roads, but would typically have no improved ditch drainage systems. Material and topsoil from the temporary roads would be bladed to one or both sides to facilitate rehabilitation. Following construction, bladed material can be respread across the disturbed road section. Seeds and roots contained within the respread topsoil layer normally provide a natural source for new growth. Some permanent roads may be constructed where necessary for operation or maintenance, or where the landowner or land managing agency requires. Road standards would be addressed specifically in the Construction, Operation, and Maintenance Plan during the engineering phase of this project.

Culverts or other drainage structures would be installed as necessary across drainages, but the roads would usually follow the natural grade. This type of temporary road would facilitate rehabilitation. Existing paved and unpaved highways and roads would be used where possible.

Roads along existing utility corridors would be used where possible to minimize new access road construction. Where existing roads can be used, only spur roads to the tower sites may be required. New access roads and spur roads may be constructed into the right-of-way where existing roads do not exist.

The approximate area of ground disturbance associated with the typical construction activities was estimated for five types or levels of access. These access levels describe the assumptions for the degree of disturbance expected to occur with each access level (refer to page 2-35, Routing Alternatives Evaluation Process). Further, the access levels consider areas of as much as five acres per mile that may be temporarily disturbed (e.g., grasses crushed) by tower construction sites, pulling, tensioning, and splicing sites, batch plants, and marshalling yards.

Wherever possible, roads would be built at right angles to streams and washes. Culverts would be installed where necessary. In addition, road construction would include dust-control and erosion control measures in sensitive areas. All existing roads would be left in a condition equal to or better than their condition prior to the construction of the transmission line.

All roads would be constructed in accordance with IPCo requirements for transmission line access roads (also refer to description above). In the event of a conflict between IPCo requirements and the requirements of the BLM and FS, the states of Idaho, Utah, Nevada, or other agencies, the governing agency requirements would take precedence. Private landowners along the proposed roads would be consulted before construction begins.

Tower Site Clearing - At each tower site, leveled areas (pads) would be needed to facilitate the safe operation of equipment, such as construction cranes. The leveled area required for the location and safe operation of large cranes would be approximately 30 by 40 feet. At each tower site, a work area of approximately 200 feet square would be required for the location of tower footings, assembly of the tower, and the necessary crane maneuvers. The work area would be cleared of vegetation only to the extent necessary. After line construction, all pads not needed for normal transmission line maintenance would be graded to blend as near as possible with the natural contours, and revegetated where required.

Clearing Right-of-Way - The clearing of some natural vegetation may be required. However, selective clearing would be performed only when necessary to provide for surveying, electrical safety clearances, line reliability, and maintenance. Topping or removal of mature vegetation, under or near the conductors, would be done to provide adequate electrical clearance as required by NESC standards (refer to Table 2-1).

Trees that could fall onto the lines or affect lines during wind-induced line swing would be removed. Normal clearing procedures are to top or remove large trees and not disturb smaller trees. Where there is a direct conflict between trees and clearance standards, the removal of trees would be jointly reviewed and agreed upon between IPCo (or LADWP for the crosstie) and the owners or managers of the property. Rights-of-way would not be chemically treated unless necessary to comply with requirements of a permitting agency.

Foundation Installation - Excavations for foundations would be made with power drilling equipment. Where the soil permits, a vehicle-mounted power auger or backhoe would be used. In rocky areas, the foundation holes may be excavated by drilling and blasting, or special rock anchors may be installed. Where required, conventional or plastic explosives would be used. Safeguards (e.g., blasting mats) would be employed when adjacent areas need to be protected.

In extremely sandy areas, soil stabilization by water or a gelling agent may be used prior to excavation. After excavations are completed, pre-cast or cast-in-place footings would be installed. Steel grillage foundations may be specified in mountainous areas.

The pre-cast footing would be lowered into the excavated foundation hole, positioned, and backfilled. The cast-in-place footing would be installed by placing reinforcing steel and a tower stub into the foundation hole, positioning the stub, and encasing it in concrete. Spoil material would be used for fill where suitable. The foundation excavation and installation would require access to the site by a power auger or drill, a crane, material trucks, and ready-mix trucks.

Construction Yards and Batch Plants - Temporary construction yards would be located near each end of the transmission line right-of-way, and approximately every 20 to 30 miles along the route. These would be located in previously disturbed sites or in areas of minimal vegetative cover where possible. All sites would be determined through discussions with land owners or the land management agencies.

Concrete for use in constructing foundations would be dispensed from a portable concrete batch plant located at approximately 20 to 30 mile intervals. A rubber-tired flatbed truck and tractor would be used to relocate each plant along the right-of-way. Commercial ready-mix concrete may be used when access to tower construction sites is economically feasible.

The construction yards and batch plants would serve as field offices, reporting locations for workers, parking space for vehicles and equipment, sites for material storage, and stations for equipment maintenance. Facilities would be fenced and their gates locked. Security guards would be stationed where needed.

Tower Assembly and Erection - Bundles of steel members and associated hardware would be shipped to each tower site by truck. Steel members would be assembled into subsections of convenient size and weight. The assembled subsections would be hoisted into place by a large crane and then fastened together to form a complete tower. Figure 2-4 illustrates typical construction activities.

Conductor Installation - After the towers are erected, insulators, hardware, and stringing sheaves would be delivered to each tower site. The towers would be rigged with insulator strings and stringing sheaves at each ground wire and conductor position.

For public protection during wire installation, guard structures would be erected over highways, railroads, power-lines, structures, and other obstacles. Guard structures would consist of H-frame poles placed on either side of an obstacle. These structures would prevent ground wire, conductor, or equipment from falling on an obstacle. Equipment for erecting guard structures would include augers, line trucks, pole trailers, and cranes. Guard structures may not be required for small roads. On such cases other safety measures such as barriers, flagmen, or other traffic control would be used.

Pilot lines would be pulled (strung) from tower to tower by a helicopter and threaded through the stringing sheaves at each tower. Following pilot lines, a larger diameter, stronger line would be attached to conductors to pull them onto towers. This is called the

pulling line. This process would be repeated until the ground wire or conductor is pulled through all sheaves.

Ground wire and conductors would be strung using powered pulling equipment at one end and powered braking or tensioning equipment at the other end of a conductor segment as shown on Figure 2-5. Sites for tensioning equipment and pulling equipment would be approximately two miles apart. If a fiber optic groundwire is installed rather than conventional groundwire, the construction methods would be the same. The appearance of a fiber optic groundwire is the same as conventional groundwire.

The tensioning site would be an area approximately 200 feet by 200 feet. Tensioners, line trucks, wire trailers, and tractors needed for stringing and anchoring the ground wire or conductor would be located at this site. The tensioner in concert with the puller would maintain tension on the ground wire or conductor while they are fastened to the towers.

The pulling site would require approximately half the area of the tension site. A puller, line trucks, and tractors needed for pulling and temporarily anchoring the counterpoise/ground wire and conductor would be located at this site.

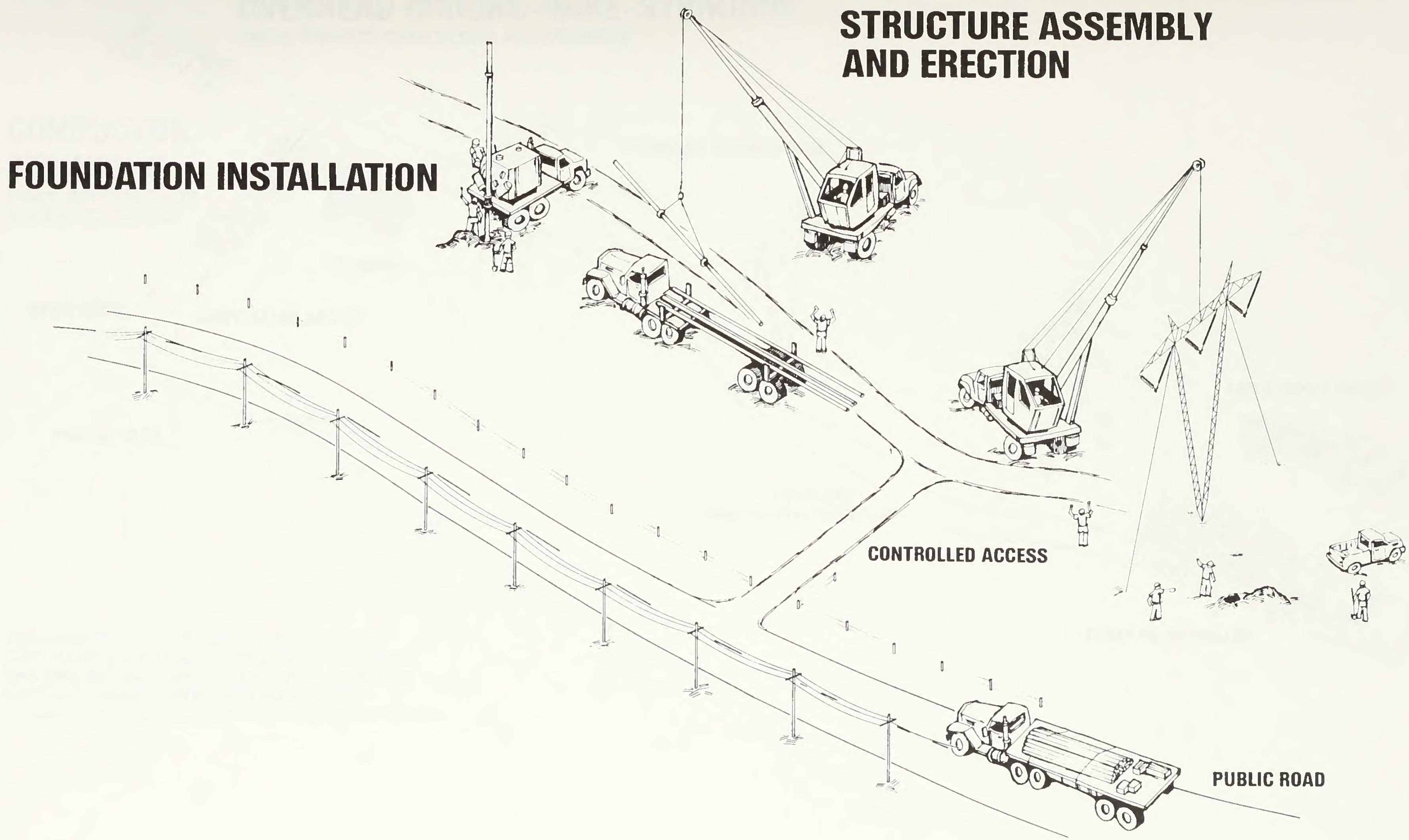
Ground Rod Installation - Part of standard construction practices prior to wire installation would involve measuring the resistance of tower footings. If the resistance to remote earth for each transmission tower is greater than 10 ohms, counterpoise (grounds) would be installed to lower the resistance to 10 ohms or less. Counterpoise would consist of a bare copper clad or galvanized steel cable buried a minimum of 12 inches deep, extending from one or more tower legs for approximately 200 feet.

Cleanup - Construction sites, material storage yards, and access roads would be kept in an orderly condition throughout the construction period. Refuse and trash would be removed from the sites and disposed of in an approved manner. Oils and fuels would not be dumped along the line. Oils or chemicals would be hauled to a disposal facility authorized to accept such materials. No open burning of construction trash would occur without agency approval.

Hazardous Materials Within Corridor - Petroleum products such as gasoline, diesel fuel, helicopter fuel, crankcase oil, lubricants, and cleaning solvents would be present within the transmission line corridor during construction. These products would be used to fuel, lubricate, and clean vehicles and equipment. These products would be containerized by fuel trucks or by approved containers. When not in use, hazardous materials would be properly stored to prevent drainage or accidents.

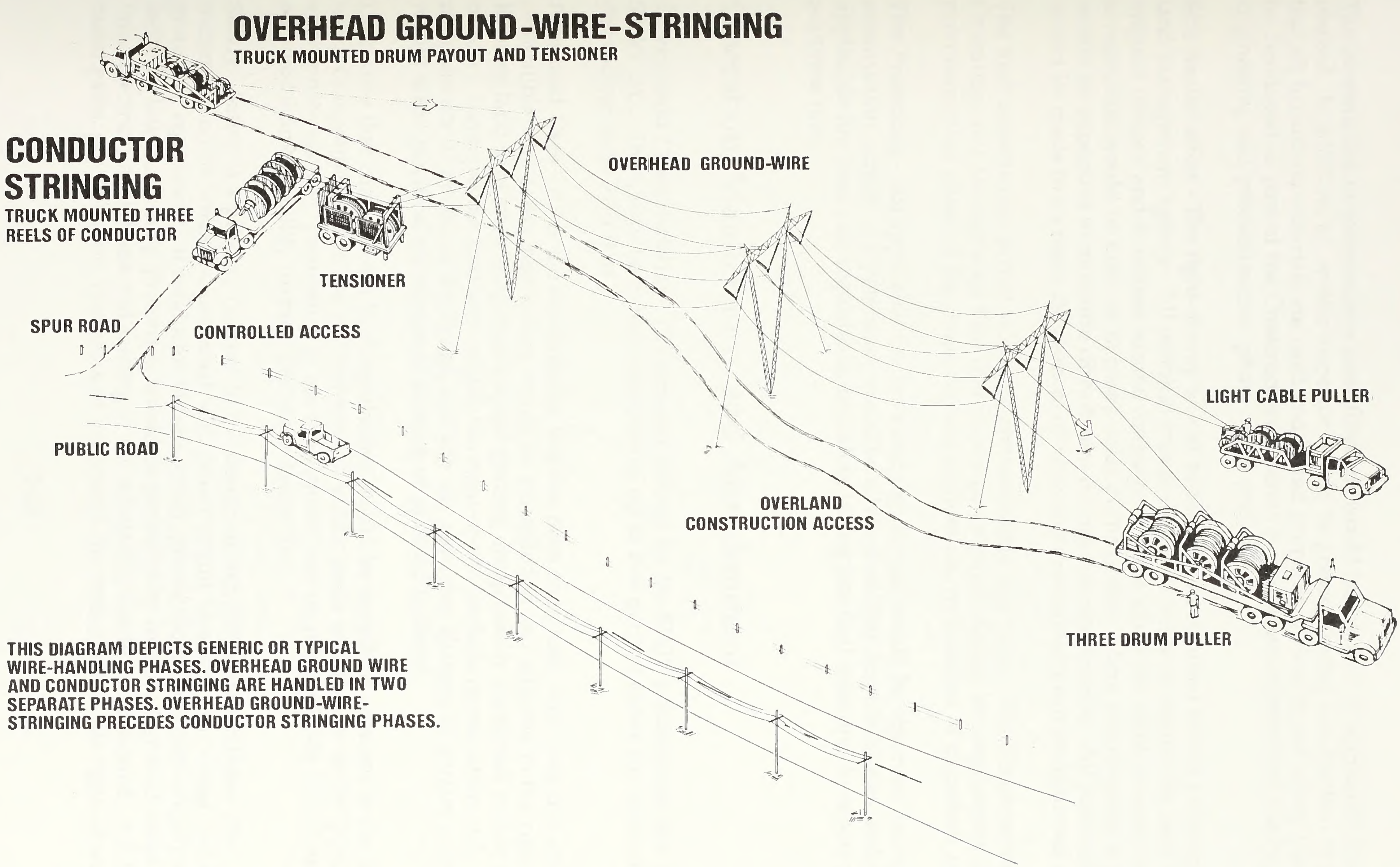
Hazardous materials would not be drained onto the ground or into streams or drainage areas. Totally enclosed containment shall be provided for all trash. All construction waste including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials would be removed to a disposal facility authorized to accept such materials.

All construction, operation, and maintenance activities would comply with all applicable federal, state, and local laws and regulations regarding the use of hazardous substances.



Typical Construction Activities

Figure 2-4



Basic Wire Handling Equipment

Figure 2-5

The construction or maintenance crew foreman would insure that all applicable laws are obeyed. In addition, an on-site inspector would be present during construction to make sure that all hazardous materials are used and stored properly. A health and safety plan would be developed as part of the Construction, Operation, and Maintenance Plan during the engineering and preconstruction phase of the project.

Site Reclamation - The right-of-way would be restored as required by the property owner or land management agency. All practical means would be made to restore the land to its original contour and to restore natural drainage patterns along the right-of-way. Because revegetation would be difficult in many areas of the project where precipitation is minimal, it would be important to minimize disturbance during the construction. All practical means would be made to increase the chances of vegetation reestablishment in disturbed areas.

The total construction period would be approximately two years. The Construction, Operation, and Maintenance Plan that would be prepared during the engineering and preconstruction phase of the project would address site reclamation of disturbed areas.

Fire Protection - All applicable fire laws and regulations would be observed during the construction period. All personnel would be advised of their responsibilities under the applicable fire laws and regulations, including taking practical measures to report and suppress fires.

Operation, Maintenance, and Abandonment

Operational Characteristics - The nominal voltage for the SWIP transmission line would be 500kV AC. There may be minor variations of up to five percent above the nominal level depending upon load flow.

Permitted Uses - After the transmission line has been energized, land uses that are compatible with safety regulations would be permitted in and adjacent to the right-of-way. Existing land uses such as agriculture and grazing are generally permitted within the right-of-way. Incompatible land uses within the right-of-way include construction and maintenance of inhabited dwellings, and any use requiring changes in surface elevation that would affect electrical clearances of existing or planned facilities.

Land uses that comply with local regulations would be permitted adjacent to the right-of-way. Compatible uses of the right-of-way on public lands would have to be approved by the appropriate agency. Permission to use the right-of-way on private lands would have to be obtained from the utility owning the transmission line.

Safety - Safety is a primary concern in the design of this 500kV transmission line. An AC transmission line would be protected with power circuit breakers and related line relay protection equipment. If conductor failure occurs, power would be automatically removed from the line. Lightning protection would be provided by overhead ground wires along the line. Electrical equipment and fencing at the substation would be grounded. All fences, metal gates, pipelines, etc. that cross or are within the transmission line right-of-way would

be grounded to prevent electrical shock. If applicable, grounding outside of the right-of-way may also occur.

Maintenance - The 500kV transmission line would be inspected on a regular basis by both ground and air patrols. Maintenance would be performed as needed. When access is required for nonemergency maintenance and repairs, IPCo would adhere to the same precautions that were taken during the original construction.

Emergency maintenance would involve prompt movement of repair crews to repair or replace any damaged equipment. Crews would be instructed to protect crops, plants, wildlife, and other resources of significance. Restoration procedures following completion of repair work would be similar to those prescribed for normal construction. The comfort and safety of local residents would be provided for by limiting noise, dust, and the danger caused by maintenance vehicle traffic. Details would be provided in the Construction, Operation, and Maintenance (COM) Plan prior to line construction.

Abandonment - At the end of the useful life of the proposed project, if the facility were no longer required, the transmission line would be abandoned. Subsequently, conductors, insulators and hardware would be dismantled and removed from the right-of-way. Tower structures would be removed and foundations broken off below ground surface.

If the line and associated right-of-way are abandoned at some future date, the right-of-way would be available for the same uses that existed prior to construction of the project.

Following abandonment and removal of the transmission line from the right-of-way, any areas disturbed to dismantle the line would be restored and rehabilitated as near as possible to their original condition.

Construction Work Force and Schedule

The total work force required to complete the phases of construction described above would be 100 to 150 people. The initial work force would consist of about 65 people. This force would be added to at approximately two-week intervals until it reaches a maximum of 120 workers. Table 2-3 lists the personnel and equipment that would be needed for the construction work force.

From past experience, it is estimated that about 50 percent of this work force would be hired locally. Those who are not local people normally take up temporary housing in nearby communities and commute to and from the job site on a daily basis. Many have their own trailers and park them where connection facilities are available, others occupy rental houses and apartments.

The target date for commercial operation of the project is late 1997. Right-of-way procurement would begin in 1993, and construction is scheduled to commence in early 1995. The project may be built in phases or sections if the market or financial conditions warrant.

Regional Environmental Study/Scoping Process

In 1988 IPCo proposed to construct a transmission interconnection from their 500kV Midpoint Substation near Shoshone, Idaho to a new substation site in the Delta, Utah area. In the Delta area, IPCo could potentially interconnect with and obtain transmission capacity on the UNTP, a proposed 500kV transmission line from Delta to the a new substation site located approximately 13 miles southwest of Boulder City, Nevada. The UNTP is owned by a consortium of utilities including LADWP, NPC, Utah Associated Municipal Power Systems (UAMPS), and Deseret Generation and Transmission Cooperative. The new substation site would be a major interconnection point, or "marketplace" substation, for the Southwest.

A regional environmental study to identify routing alternatives was completed for the SWIP in late 1988. Because it was determined in 1989 that transmission capacity for the SWIP would not be available on the UNTP, the project description was revised to include a connection from the Ely, Nevada area to a new substation site to be located northeast of Las Vegas, Nevada (also refer to page 2-31). The purpose and need for the proposed Ely, Nevada to Delta, Utah segment was revised as well (refer to right-of-way acquisition on page 2-17). The following section describes how the alternatives compared in the EIS were identified and finalized.

Identification Of Alternatives

Through the 1988 regional environmental studies, approximately 2,000 miles of routing alternatives were identified as being reasonable and feasible between Midpoint and Delta. The regional environmental study of southern Idaho, northeastern Nevada, and western Utah was completed as part of the scoping process (also refer to Chapter 5 and the Objectives, Procedures, and Results Technical Report). Environmental analysis completed during the regional studies and the scoping process for the SWIP EIS determined which alternative routes were reasonable and feasible to construct and operate. These alternatives were then evaluated in detail to facilitate comparing alternatives in this document.

The regional study was begun in June 1988 and completed in December of the same year. The purpose of the study was to determine, as mandated by NEPA (1969) and the implementing CEQ regulations (1978), all reasonable and feasible transmission line routing alternatives connecting from Midpoint Substation to the Delta, Utah area (also refer to the Objectives, Procedures, and Results Technical Report and later in this chapter for more on the Alternatives Evaluation Process). The study area encompassed about 80,000 square miles in the three states. Satellite imagery enhanced the data collected from agencies throughout the study area. The major resource areas evaluated included:

Natural environment

- threatened and endangered plant and animal species
- wildlife habitat and use areas
- plant habitat

- soils and geology
- surface hydrology

Human environment
- existing, planned, and designated land uses
- parks, recreation, and preservation uses
- scenic and aesthetic resources

Cultural environment
- archaeology
- prehistory
- enthnohistory
- history

A sensitivity analysis was completed, and opportunities and constraints were determined to identify potential alternative routes for the SWIP. Sensitivity is the measure of the probable adverse response of each resource to direct and indirect impacts associated with the construction, operation, maintenance, and abandonment of the proposed transmission line. Criteria used in this determination included:

- **Resource Value**: A measure of rarity, high intrinsic value or worth, singularity or diversity of a resource within the study area or region.

- **Protective Status**: A measure of the formal concern expressed for a resource either through legal protection or by designation of special status.

- **Present or Future Uses**: A measure of the level of conflict based on policies of land management agencies and/or use.

- **Hazards**: A measure of the degree to which a resource represents a significant hazard to construction and/or operation of the proposed project.

These resources were then mapped according to their respective sensitivity level as follows:

- **Exclusion Area**: Areas determined to be unsuitable because of unique, highly valued, complex or legally protected resources, significant potential conflict with current or planned use, and areas posing substantial hazards to construction and operation of the line. For purposes of selection of corridors, exclusion areas were avoided.

- **Avoidance Area**: Areas of potentially high environmental impact because of important, valued resources, resources assigned special status, some conflict with current or planned use, and areas posing some hazard to construction and operation of the facility. In corridor selection these areas were avoided where possible or conflict with these areas was minimized if avoidance was difficult or impossible.

- **Low to Moderate Sensitivity**: Areas where the resource conflicts that have been identified through the regional environmental study process are minimal, or present little hazard to construction or operation of the facility.

After completing the sensitivity analysis for each resource, a composite sensitivity map was prepared through an overlay process of all the resource sensitivity maps. This composite was used to identify constraints and locational opportunities resulting from combinations of the three levels of environmental sensitivity for the five major resource areas: visual, land use, biology, earth, and cultural. Alternative corridor locations were then plotted taking into account the composite sensitivity, the locations of existing transportation and utility corridors, topographic constraints, and utilizing public lands. The corridor width varied somewhat to reflect the locations of constraining environmental features, yet allow sufficient margin for planning within each corridor. Corridors describe linear paths where:

- features or areas of exclusion were avoided (e.g. residences, airstrips, wells, and other sensitive land use features)
- crossing of features or areas of avoidance was minimized
- locations through steep or rugged topography were minimized
- proximity to existing roads that could be utilized for access was maximized
- locations parallel to existing transmission or existing utility corridors were maximized
- routing on private lands was minimized in favor of public lands

Several members of BLM, a FS representative, engineers from IPCo and LADWP, as well as project management from the consulting firm, Dames & Moore, were present during and participated in the identification of alternative corridors. Based upon the environmental data available for the regional studies, the selection participants determined that all reasonable alternatives had been identified. The resulting alternatives were presented to the SWIP Steering Committee for review (also refer to Chapter 5). The Steering Committee did not identify any additional alternatives.

About 3,000 miles of alternatives were initially identified in the regional study (refer to Figure 2-1). Through a joint effort involving IPCo, LADWP, BLM, FS, Bureau of Reclamation, NPS, and Dames & Moore, the initial alternatives identified in the regional study were reviewed through numerous field and aerial surveys. The objective of the field review was to refine the broad "corridors" of the alternatives, and to delineate assumed centerlines based on environmental and engineering input, and to further the familiarity of the study team with the environmental, physiographic, and engineering characteristics of the study corridors. These assumed centerlines formed the basis for the study area for each alternative route that was later studied in detail in the EIS. The field review and delineation of the assumed centerlines was completed in the period of April 1989 to July 1989. Following scoping, about 2,000 miles of these alternatives were identified as being reasonable and feasible for detailed study based on the regional environmental issues, public acceptability, and engineering constraints. The results of the route evaluation are documented in the SWIP project files and in the Southwest Intertie Project Regional Environmental Study report (Dames & Moore, April 1989).

Following completion of the regional studies, IPCo determined that an interconnection point would be needed in the Ely, Nevada area to best use projected regional resources (e.g., future WPPP in the Ely, Nevada area). Refer to page 2-31 for more information regarding the project expansion of the SWIP from Ely south to the Las Vegas area.

Develop Scope/Preparation Plan

A Scope/Preparation Plan was developed for the environmental documentation process (refer to Preparation Plan for the Southwest Intertie Project Environmental Studies - Phase II, Dames & Moore, July 1989). This plan considered the following:

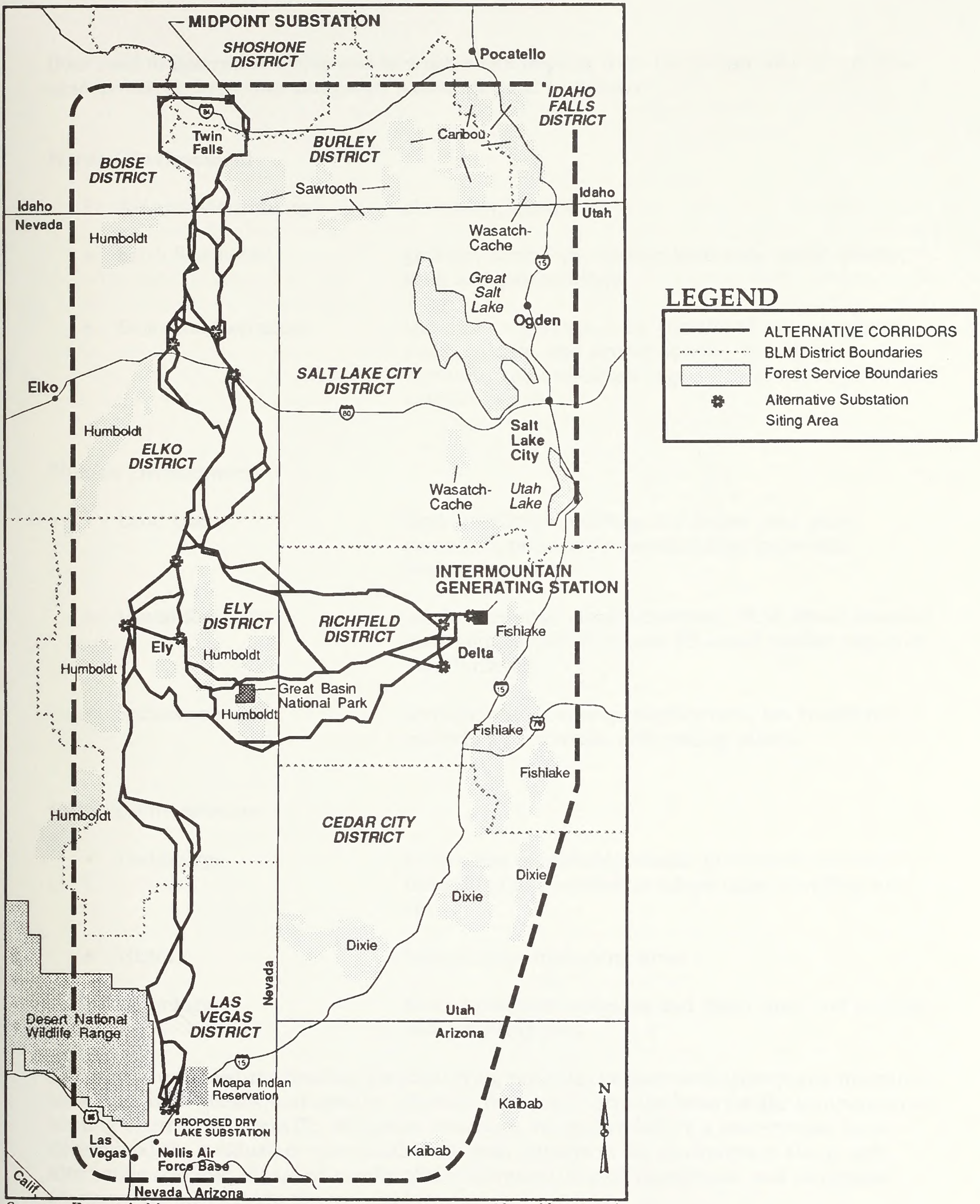
- previous environmental studies, reports, and EISs
- Draft and Final Humboldt National Forest Land and Resource Management Plan
- the Management Framework Plans (MFPs) of the Burley District and Shoshone in Idaho
- the Resource Management Plans (RMPs) of the BLM resource areas in the Boise and Shoshone Districts in Idaho, the Elko and Ely Districts in Nevada, and Richfield District in Utah
- issues and alternatives resulting from the regional environmental siting studies
- input from the agency contacts and public scoping meetings
- federal environmental reporting and compliance requirements as mandated by NEPA (1969) and the CEQ regulations (1978)

In addition when the project was extended to Dry Lake in May 1991, the MFPs of the Las Vegas District in Nevada were considered.

Corridor Studies

Following completion of the regional studies, scoping meetings, and agency input and review, approximately 2,000 miles of alternative corridors were initially studied in detail (refer to Figure 2-6). The study areas established along the assumed centerline of each alternative ranged in widths from two to six miles depending upon the needs of and concerns for each resource study (discussion in Chapter 4). Detailed environmental data were compiled on maps at a scale of 1:100,000 within these "study corridors".

Following the identification of final alternative routes, the environment was inventoried for nine resource categories to establish current environmental conditions. This baseline was



Source: Dames & Moore

Note: Not to scale

Southwest Intertie Project Alternative Corridors

Figure 2-6

then used to determine where and to what extent impacts from the project may occur. The nine inventoried resource categories were organized as follows:

Natural Environment

- Air and Meteorology: air quality, climate
- Earth Resources: geology, hydrology, springs inventory, water quality, soils, and paleontology
- Biological Resources: terrestrial vegetation, rare, threatened or endangered plant, wildlife, and aquatic species, floodplains, wetlands, and associated vegetation, sensitive plant and wildlife habitat

Human Environment

- Land Use: land jurisdiction, existing and future uses, park, recreation, preservation areas, range lands and improvements
- Visual Resources: scenic resources, visual sensitivity, BLM visual resource management (VRM) classes, FS visual quality objectives (VQO) classes
- Socioeconomics: demography, economy, employment, tax jurisdictions, community resources, and grazing effects

Cultural Environment

- Prehistory: known and expected/probable prehistoric resources including lithic scatters, antelope traps, dwelling sites, etc.
- History: historic sites, trails, structures
- Ethnology: Native American religious and ritual sites, and hunting and gathering sites

These data provided the baseline for identifying potential impacts and appropriate mitigation measures, both generic and specific. Further, these data form the basis for the comparison of routing alternatives. Specific mitigation measures, recommended on a case-by-case basis, determined the residual, or unavoidable adverse, impacts to the environment along each alternative corridor. Detailed results of the inventory, impact assessment, and mitigation planning are provided in the technical report.

The assessment of environmental impacts is based upon an assumed reference centerline for the proposed transmission line. Impacts identified in this document were assessed assuming maximum movement of one-quarter mile from the assumed centerline for the final engineered right-of-way.

The corridor studies were initiated in the summer of 1989. The collection of detailed environmental data for the resource areas is previously described. The inventory of resource data involved contacts with federal, state, and local agency resource specialists and land managers. The data, collected, mapped, and field verified by Dames & Moore resource investigators, were reviewed by agency resource specialists. In addition to the environmental resources, electrical and magnetic field (EMF) effects have been analyzed for the SWIP.

The planning process used for the SWIP applied advanced computer technology in the form of a geographic information system (GIS) to map, analyze, and manage the voluminous data collected for the inventory. The data collected by resource investigators were supplemented by "remotely sensed" data from another advanced technology, multi-spectral satellite data. GIS was also used during the impact assessment and mitigation planning process. The system applied a variety of models developed by resource investigators to evaluate and assess the potential impacts the proposed project.

These data provided the baseline for identifying impacts, appropriate mitigation measures, and comparing the routing alternatives. Detailed results of the inventory, impact assessment, and mitigation planning are provided in the supplemental resource technical reports (Volumes II, III, and IV of the supporting technical reports).

Several adjustments, modifications, and additions to the assumed study centerlines were made during the corridor studies. In July 1989, the Burley District of the BLM in Idaho requested that alternative centerlines be evaluated on both sides of the existing midpoint to Valmy 345kV line from just south of Cottonwood Creek in southern Idaho to the Idaho-Nevada border. In addition, discussions with the superintendent of the Fossil Beds National Monument near Hagerman, Idaho, in June 1989 resulted in the addition of Link 62 to potentially reduce visual impacts to the monument. Links 61 and 64 were also adjusted slightly to avoid potential conflicts with the boundary of this national monument. (Links are route segments that connect to others to form the network of routing alternatives being considered).

During June 1989, the superintendent of the Great Basin National Park requested that alternatives be developed to avoid visual impacts to Great Basin National Park. In response, alternatives that would cross through military operating areas (MOAs) of the Utah Training and Testing Range (UTTR) of Hill Air Force Base (Links 262, 263, 264, 266, 267, and 268) were included. In August 1989 the superintendent also requested that an additional alternative be developed that would cross the Restricted R-6405 Area of the UTTR. In response, the Links 61, 63, and 64 (Direct Route) were developed and included in the alternatives studied in detail. Both of these added alternative routes would avoid visual impacts to Great Basin National Park.

In July 1989, the Elko District of the BLM requested the addition of several alternatives to Links:

- Link 71 between Jackpot and Contact, Nevada to potentially reduce visual impacts to U.S. Highway 93 (shown as Link 70 on maps)
- Links 711, 713, 714, and 715 to provide an alternative crossing of U.S. Highway 93 near Contact, Nevada
- Link 83 along Shoshone Creek just south of the Idaho-Nevada state line to provide another alternative route into the Trout Creek area
- Link 211 crossing Interstate 80 northwest of Oasis, Nevada to potentially reduce visual impacts
- Link 224 near Ferguson Mountain to potentially reduce visual impacts to U.S. Highway 93A
- Link 1612 to provide an alternative that could connect with the proposed Thousand Springs Power Project (Thousand Springs has been canceled)
- Links 161, 163, 164, 165, 166, 167, and 168 north of Wells, Nevada, to potentially reduce visual impacts to U.S. Highway 93

The Ely District in Nevada also made several requests for additions or revisions to the assumed alternative centerlines. In mid 1989 the District requested that Link 293 be added because of concerns about wildlife watering holes in the Antone Pass area on Link 280. An alternative route consisting of Links 362 and 363 into the Robinson Summit substation siting area from the north was desirable to BLM.

In early 1990, IPCo determined that the UNTP would not be able to provide the transmission capacity for the SWIP to reach the new substation near Boulder City, Nevada. IPCo decided that the SWIP would have to be extended south from the Ely area in order to meet the purpose and need for the SWIP project to interconnect in the Las Vegas area. In June 1990 the SWIP studies were expanded to include routes from the Ely, Nevada, area to a new substation site northeast of Las Vegas in the Dry Lake Valley.

To accommodate this expansion, the BLM determined that the SWIP route should follow the preferred route approved in the 1985 Record of Decision for the White Pine Power Project (WPPP), and that the studies for the WPPP should be updated to the same level of detail as the SWIP studies from Midpoint to Ely and Ely to Delta. No regional studies were completed between Ely and Dry Lake to determine other alternative routes. If the SWIP is approved in a Record of Decision, the WPPP Record of Decision would be amended so that the SWIP and the two lines proposed for WPPP would be consolidated in the same corridor. If one of the alternative routes avoiding Link 720 (Coyote Spring Valley) is selected, the SWIP Record of Decision would not amend the WPPP Record of Decision to consolidate the corridors in this area. The decision to construct the WPPP transmission system through Coyote Spring Valley would remain.

The lead federal agency for the SWIP, the BLM, recommended that one portion of the UNTP be retained in the SWIP EIS/PA process, although technically not a part of the SWIP. This

approximately 150 mile transmission line segment would extend east from the vicinity of Ely, Nevada, to near Delta, Utah. The right-of-way for this segment would be granted to IPCo and then assigned to LADWP for construction and operation of this portion of the line and a new substation at the Intermountain Generating Station near Delta, Utah. The action was recommended because of the amount of work completed on the route already, and the likelihood it would be reproposed by LADWP as the only part of UNTP not having an existing record of decision or right-of-way grant.

Prior to being added to the SWIP, the additional alternatives described below were evaluated for environmental and engineering feasibility during overflights. Further, BLM requested that the assumed centerlines for these alternatives be located such that the resulting utility corridor would accommodate the two future WPPP transmission lines. Assumed centerlines for the additional alternatives were determined jointly by the SWIP project management, BLM, and IPCo engineers requests.

Scoping was reopened for the project expansion to determine the issues and concerns for the SWIP between Ely and the Las Vegas area (also refer to Chapter 5). During the scoping period, contacts were made with the Nellis Air Force Base (AFB) to inform the military of the proposed project. The air space manager for Nellis Air Force Base expressed concerns about the route passing through areas designated as MOAs. The Air Force conducts low-altitude aircraft operations in these areas to train combat pilots. Subsequent meetings with representatives from Nellis AFB in August 1990 helped identify several additional alternatives (Links 672, 673, 674, and 675) that should be evaluated. In addition, the Caliente Resource Area of the BLM also suggested the need to evaluate Link 675 because it would parallel an existing 69kV power line in a utility corridor designated in the Caliente Resource Area Management Framework Plan of the Las Vegas District of BLM.

In September 1990, the Ely District requested that Link 363 be added as an alternative to avoid known ferruginous hawk nests along Link 361. Similarly, because of additional concerns for visual impacts and impacts to sage grouse leks and nesting areas in the vicinity of Jackpot and Contact, Nevada, two additional alternatives (Links 714 and 715) were requested in January 1991 by the Elko District of the BLM.

In September 1990 BLM requested that the SWIP studies evaluate the engineering and environmental feasibility of routing the SWIP roughly parallel to Nevada State Highway 7 toward the community of Moapa, Nevada, through a pass at the northern tip of the Arrow Canyon Range (Link 730). The proposed alternative would then enter a major utility corridor through the Moapa Indian Reservation parallel to Interstate 15 to reach the Dry Lake area.

BLM made this request because of concerns for desert tortoise in the Coyote Spring Valley. This concern was of particular concern because of the ongoing Section 10 (of the Endangered Species Act) consultation being conducted for private lands slated for development in Clark County. Under the Habitat Conservation Plan (HCP) being prepared, a desert tortoise conservation area was being proposed on public lands in Coyote Spring Valley. Because they were cooperating on ongoing planning work for desert tortoise, the BLM requested that other routing alternatives be considered for the planned transmission lines through this area. BLM was also concerned about visual impacts to travelers of U.S. Highway 93.

The BLM initiated a Resource Management Plan (RMP) process for the Stateline Resource Area in January 1990. The draft plan and EIS are planned to be released for public review in mid 1992. Utility corridors are among the many issues addressed by the plan. The BLM has coordinated the SWIP EIS and RMP EIS processes, to the extent possible, in determining the locations of both transmission lines and utility corridors.

Reliability concerns if the SWIP were constructed in the major utility corridor across reservation lands would be similar to those discussed on page 2-17 (e.g., paralleling the UNTP). Other major regional transmission lines, as well as several smaller transmission lines, are already sited in this corridor (also refer to Reliability on page 1-8).

A feasibility report was prepared and completed in February 1991. The purpose of this study was to evaluate the feasibility of constructing future lines through the Moapa area because of the concern for further visual impacts and disturbance to desert tortoise habitat in Coyote Spring Valley (Figure 2-7). Several potential routes were evaluated to identify the environmental and technical/economic issues.

In June of 1991, based on the results of the feasibility report, BLM determined that several of the routes should be studied in detail for the EIS. The route that would roughly parallel Nevada State Highway 7 from the north end of the Arrow Canyon Range to a point near the community of Moapa and then southwest toward the Dry Lake Valley in the designated utility corridor was eliminated from further consideration because of many environmental, technical, and cost issues. Near the Reid-Gardner Generating Station the route would either have to cross the coal storage area on the east side of the generation station or the wetland areas on the west side of the generating station. The line could not be routed far enough east to avoid the coal storage area because of the major regional transmission lines (IPP-Adelanto 500kV DC transmission line and the Navajo-McCullough 500kV transmission line) located in this area, and the SWIP cannot feasibly cross these lines. Environmentally the route would likely result in many miles of visual impacts along Highway 7 and the residential concentrations in the Moapa and Glendale areas. Additionally, BLM determined that this route would not meet their planning criteria for locating utilities within corridors.

Another route, which crossed Aerojet lands outside of the designated utility corridor northwest of the Moapa River Indian Reservation, was eliminated from further consideration. The study determined that a utility corridor had already been established through the Aerojet lands by Congress in the Nevada-Florida Land Exchange Authorization Act of 1988 (PL 100-275). The legislation states under 102 Stat.55(b,1) that "Activities to construct, operate, and maintain electric transmission lines within the corridor shall be given priority over all other conflicting activities."

Several of the alternative route segments were determined to be reasonable and feasible and were studied in detail for the EIS (Figure 2-7). Two of the route segments would cross the Moapa Indian Reservation lands. During the fall of 1991 consultation with the Tribal Council determined that these routes could be considered through the EIS process. These were evaluated during November and December of 1991 (Links 730, 740, 750, 760, 780, and 790). A public information meeting was held in the Tribal Office of the Moapa Band of the Paiute on December 17, 1991. Also refer to discussion of Subroute Set 23 in Appendix D.

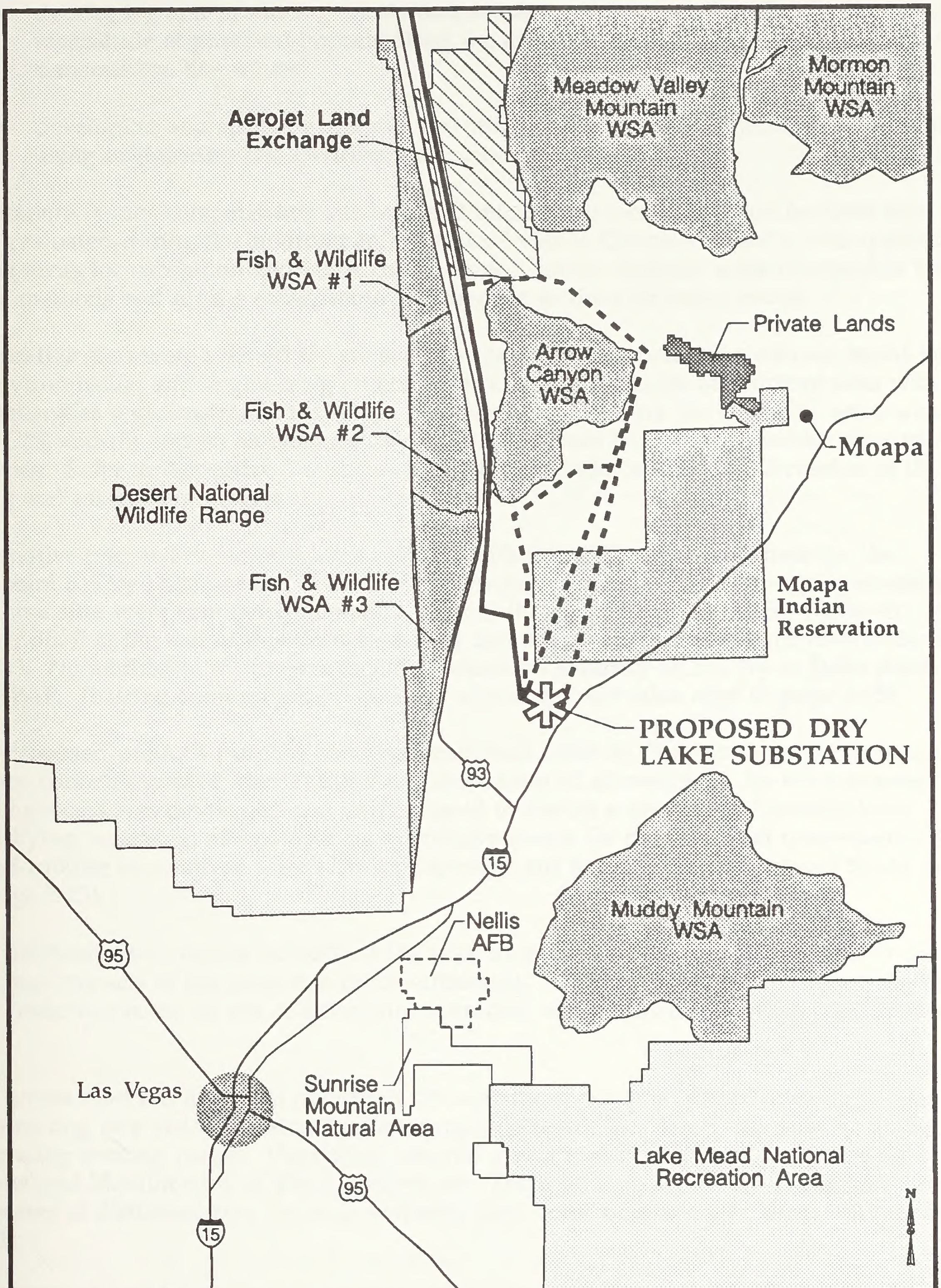
In 1985, the Record of Decision (ROD) for the WPPP stated that the two 500kV transmission lines would be constructed through the Coyote Spring Valley parallel to U.S. Highway 93. In addition, the BLM had previously granted a Right of Way for a second 500kV line from the Intermountain Generating Station. In 1990 this grant was transferred to LADWP for the UNTP. Therefore, the UNTP line would be constructed along the Coyote Spring Valley route (Link 720), and the WPPP lines are approved through the 1985 ROD for this same Coyote Spring Valley route.

Following the impact assessment and mitigation planning process, the Coyote Spring Valley route was determined to be environmentally preferred. This route would avoid significant impacts to cultural sites and visual impacts to high sensitivity recreation viewpoints. All of the routing alternatives evaluated on the east side of the Arrow Canyon Range and on or near the Moapa River Indian Reservation, would result in high visual impacts to recreationists on the east side of the Arrow Canyon WSA and to a proposed interpretative trail in the area. In addition, these routes would result in direct impacts to several important ethnohistoric and historic sites located in Arrow Canyon along Link 730. Desert tortoise impacts on routes both east and west of the Arrow Canyon Range are considered to be mitigable. Also refer to Appendix D for additional information.

Routing Alternatives Evaluation Process

A GIS was used to assist in the preparation of the required environmental impact statement/plan amendment (EIS/PA). The GIS was originally used to evaluate environmental issues and help identify alternative transmission line corridors in Phase I of the SWIP (refer to the SWIP Regional Environmental Report, April 1989). GIS processing was performed using Dames & Moore's Geographic Information Management System (GIMS). The following summarizes the sequence of GIS applications:

- digitizing of resource inventory data as collected and recorded on maps by resource principal investigators
- producing baseline resource inventory maps and data reports
- conversion of mapped resource data to a digital database format
- developing pre-assessment models to establish the level of potential ground disturbance associated with construction activities, the potential increase in public access into remote areas, and degree of visible change in the landscape
- developing of impact assessment models to evaluate how the construction and operation of the proposed project would effect resource values and features
- producing of impact maps (to scale) that graphically illustrate the locations and magnitudes of potential resource impacts



Source: Dames & Moore

Note: Not to Scale

Moapa Feasibility Study

- developing and producing tabular impact data reports that describe the location and magnitude of potential impacts along the assumed centerline of alternative transmission line routes

- developing and applying analysis for siting and selecting substation facility locations using engineering and environmental criteria

Substations, series compensation stations, and microwave communication facilities sites were also evaluated during the environmental studies (refer to Chapters 3 and 4, and appendices). Siting areas for substation and series compensation station facilities were inventoried by the same methods and for the same resource categories as the alternative routes.

Alternative sites were selected for substations and series compensation stations based on a set of environmental and engineering criteria. The GIS facilitated the selection of sites with opportunities and constraints mapping. The resource inventory for the siting areas was input into GIS, and the impact assessment used models adapted from those used for the corridor analysis. Refer to Appendix E at the end this document for additional discussion of the siting and assessment process.

Alternative microwave facilities sites were identified by IPCo representatives for the Midpoint to Dry Lake portion of the SWIP. The resource inventory and impact assessment for these sites were conducted manually without the assistance of the GIS. (Refer to Appendix F at the end of this document for a detailed discussion of the microwave facilities study). No additional microwave facilities would be required on the Ely to Delta portion of the SWIP. Existing communication facilities would be used (also refer to page 2-15).

The proposed project's purpose and need statement (refer to Chapter 1), public issues, and agency concerns guided identification and evaluation of alternatives. An environmental study process was developed and implemented to ensure a systematic framework for identifying, assessing, and comparing alternative routes for the proposed transmission line. Initial routing alternatives were identified through the Regional Environmental Study (refer to page 2-23).

The necessary information for each of the alternative routes was collected to predict the potential impacts of the project to the environment. The project team determined the impacts that could be caused by the construction, operation, and maintenance of the transmission line.

The access road requirements determine the amount of potential disturbance (e.g., constructing new roads, constructing spur roads to tower locations from existing roads, or upgrading existing roads). Vegetation removal was a major consideration during field review and identification of alternative routes. The following access levels are preliminary estimates of disturbed area for main and spur road construction, tower sites, and marshalling yards:

1. Agricultural areas, no new access roads needed.

2. No new access roads needed, use existing roads, build spur roads into tower sites. Less than 0.75 mile of new access road per mile of transmission line. Disturbed area is about 1.5 acres per mile for access roads and about 1.0 acre per mile for tower sites and marshalling yards.

3. New access roads in flat to gently rolling terrain. Slopes are 0-8 percent. Approximately 1.0 -1.25 mile of new access road per mile of transmission line. Disturbed area is about 2.0 acres per mile for access roads and about 1.0 acre per mile for tower sites and marshalling yards.

4. New access roads in moderately steep slopes. Slopes are 8-35 percent. Approximately 1.0 - 2.0 miles of new access road per mile of transmission line. Disturbed area is about 4.0 acres per mile for access roads and about 1.0 acre per mile for tower sites and marshalling yards.

5. New access in steep terrain. Slopes are 35-65 percent. Approximately 2.0 - 3.0 miles of new road per mile of transmission line. Disturbed area is about 6.0 acres per mile for access roads and about 1.0 acre per mile for tower sites and marshalling yards.

The levels of potential increases in public accessibility that could result if new roads are constructed in remote areas are described below:

0 - 20%	the line routes could generally be accessed by existing roads; only a few short spur roads may be required; little to no increase in public access is expected
20 - 40%	there are some existing roads in the area; some new road construction may be needed to access the line route in some areas
40 - 50%	some existing roads are in the vicinity; new roads would be needed to large portions of the line route
50 - 100%	remote areas with few, if any, existing roads; new roads would be needed to gain access to much of the line route

The resulting data were summarized into profiles of 0.1 mile increments for each alternative corridor. The alternative corridors were then compared, and an environmentally preferred route identified.

COMPARISON OF FINAL ROUTING ALTERNATIVES

Preferred route selection was based upon the comparison of alternative routes between the Midpoint Substation near Shoshone, Idaho, and the proposed substation at Dry Lake northeast of Las Vegas, Nevada, and alternative routes between the Ely, Nevada area and the Delta, Utah area. Seven final routing alternatives were identified for the Midpoint to Dry

Lake portion based on combinations of routing alternatives environmentally preferred by the five major resources. Four final routes were identified for the Ely to Delta portion. These routes are compared later in this chapter of this document and the environmentally, agency, and utility preferred route(s) are identified (Refer to Map Volume).

The final selection of substation and series compensation station sites were based on the selection of the environmentally preferred route. The impacts of the microwave facilities sites are also documented in Appendix F.

To assist in the determination of routing preferences, the environmental consequences for each route were summarized based on the residual impact assessment results (after mitigation measures applied), specific environmental resource preferences, and agency and public comments. A reasonable number of the best environmental routing alternatives were determined from combining individual links to make complete routes.

Subroutes sets are made up of localized alternatives that have common beginning and end points. Subroutes were evaluated in order to reduce the potential number of routes that could be derived from the link segments. Figure 2-8 illustrates the twenty-four sets of subroutes that were identified and evaluated to help derive the alternative routes compared in this document. The link segments where no local routing decisions were necessary, were termed connectors. The environmentally preferred subroute within each set of subroutes was selected and combined with the connector links to form alternative routes. The subroute selection process is described in Appendix D of this document, and is accompanied by maps and summaries of the resource impacts for each subroute set (also refer to the Objectives, Procedures, and Results Technical Report).

Midpoint to Dry Lake

Transmission Line Alternatives

The resulting network of routes was organized into eight major routing alternatives from Midpoint Substation in Idaho to the proposed substation at Dry Lake northeast of Las Vegas, Nevada:

- **Route A** - 345kV*-Thousand Springs-Goshute Valley-Steptoe-Egan Range-Dry Lake Alternative is comprised of link segments:

  10, 20, 41, 40, 50, 70, 72, 101, 102, 110, 130, 160, 161, 162, 1612, 152, 200, 211, 212, 230, 250, 259, 260, 261, 270, 291, 293, 310, 340, 362, 363, 669, 670, 672, 673, 675, 690, 700, 720

- **Route B** - 345kV*-Trout Creek-Wendover-Steptoe-Antone Pass-Dry Lake Alternative is comprised of link segments:

  10, 20, 41, 40, 50, 70, 72, 91, 92, 140, 141, 142, 144, 200, 221, 222, 224, 226, 259, 261, 270, 280, 310, 340, 362, 363, 669, 670, 672, 673, 675, 690, 700, 720

- **Route C** - 345kV*-Trout Creek-Goshute Valley-Steptoe-Egan Range-Dry Lake Alternative is comprised of link segments:

  10, 20, 41, 40, 50, 70, 72, 91, 92, 140, 141, 142, 144, 200, 211, 212, 230, 250, 259, 260, 261, 270, 291, 293, 310, 340, 362, 363, 669, 670, 672, 673, 675, 690, 700, 720

- **Route D** - 345kV*-Wells-Steptoe-Egan Range-Dry Lake Alternative is comprised of link segments:

  10, 20, 41, 40, 50, 70, 72, 101, 102, 110, 130, 160, 161, 162, 1611, 166, 167, 1613, 180, 190, 230, 241, 243, 245, 261, 270, 291, 293, 310, 340, 362, 363, 669, 670, 672, 673, 675, 690, 700, 720

- **Route E** - 345kV*-Thousand Springs-Wendover-Steptoe-Egan Range-Dry Lake Alternative is comprised of link segments:

  10, 20, 41, 40, 50, 70, 72, 101, 102, 110, 130, 160, 161, 162, 152, 200, 221, 222, 224, 226, 259, 261, 270, 291, 293, 310, 340, 362, 363, 669, 670, 672, 673, 675, 690, 700, 720

- **Route F** - Hagerman-Trout Creek-Goshute Valley-Egan Range-Dry Lake Alternative is comprised of link segments:

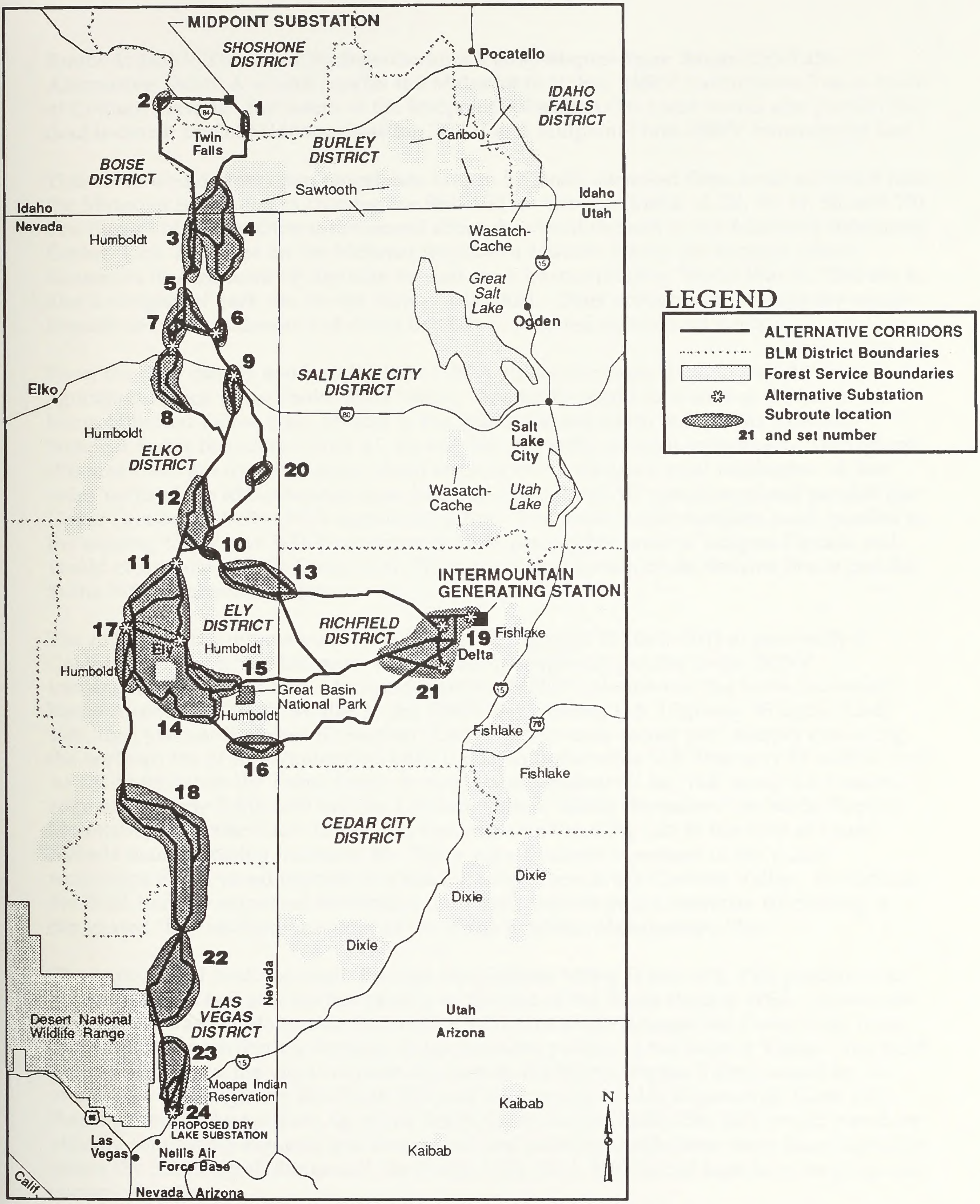
  61, 62, 64, 70, 72, 91, 92, 140, 141, 142, 144, 200, 211, 212, 230, 250, 259, 260, 261, 270, 291, 293, 310, 340, 362, 363, 669, 670, 672, 673, 675, 690, 700, 720

- **Route G** - 345kV*-Cottonwood Creek-Thousand Springs-Goshute Valley-Steptoe-Egan Range-Dry Lake Alternative is comprised of link segments:

  10, 20, 41, 40, 50, 70, 711, 714, 101, 715, 713, 110, 130, 150, 151, 152, 200, 211, 212, 230, 241, 243, 245, 261, 270, 280, 310, 340, 362, 363, 669, 670, 672, 673, 675, 690, 700, 720

  * - parallels Midpoint to Valmy 345kV transmission line

The following section describes various issues and resource preferences for each route compared. Environmental data are summarized in Table 2-4 and committed mitigation by alternative route is shown in Table 2-5.



Source: Dames & Moore

Note: Not to scale

Subroute Location Map

Route A: 345kV-Thousand Springs-Goshute Valley-Steptoe-Egan Range-Dry Lake Alternative Route A would parallel the Midpoint to Valmy 345kV transmission line to south of Contact, Nevada. Just south of the Midpoint Substation this route would also parallel the double-circuit line of Midpoint-Stateline 345kV and Midpoint-Hunt 230kV transmission line.

This route would cross open rangelands broken by small dispersed farm areas southeast from the Midpoint Substation to crossing the Snake River Canyon (Links 10, 20, 40, 41, 50, and 70). The Bureau of Reclamation is concerned about the visual impacts to the Minidoka Relocation Center (Link 20), a site on the National Register of Historic Places, the location where thousands of Americans of Japanese descent were interned during World War II. The site is also a designated park site for the Idaho Centennial. Other concerns in this area are visual impacts to rural residences and direct impacts to irrigated agricultural lands.

From the river canyon south to the toe of the foothills, the route (Link 41) would cross agricultural lands in the Snake River Valley. The route would turn west at the toe of the South Hills and follow them around to the southwest and south outside the Sawtooth National Forest boundary (Links 41, 40, and 50), primarily through rangelands. Throughout this area there are concerns about visual impacts to the scattered rural residences. A few miles north of the Idaho-Nevada state line, this route (Link 70) would meet and parallel the Upper Salmon to Wells 138kV transmission line. The route would continue south parallel to the existing 138kV and 345kV transmission lines passing just west of Jackpot, Nevada and would cross Salmon Falls Creek (Link 72) in the rolling terrain of the Browns Bench parallel to the 345kV transmission line.

The route would continue south parallel to U.S. Highway 93 (Link 101) to just north of Contact, Nevada, where the route would cross the highway parallel to the 345kV transmission line (Link 102). At Rocky Peak the 345kV transmission line turns southwest. Route A continues south parallel to the 138kV line crossing U.S. Highway 93 again (Link 160), then just north of the HD Summit (Link 162) the route would turn sharply east along the northern toe of the Windermere Hills (Link 1612) and cross U.S. Highway 93 a third time. As the route enters the Toano Draw, it would turn southeast (Link 152) along the western edge of the draw (Link 200) into the Goshute Valley. Along the eastern toe of the Pequop Mountains, the route (Link 211) would continue south passing just to the west of Oasis, Nevada before crossing Interstate 80. There were concerns expressed in the public workshops about visual impacts to a ranch headquarters in the Goshute Valley. In addition, the BLM has also expressed concerns about visual impacts at the Interstate 80 crossing, a designated "low visibility" corridor in the Wells Resource Management Plan.

The route would continue south through the Goshute Valley (Links 212, 230) parallel to an unused railroad bed past Shafter passing to the east of the South Pequop WSA. Northwest of the Dolly Varden Mountains, the route would turn south through the Currie Hills (Link 250) towards Lages Station, Nevada, in the northern portion of the Steptoe Valley. The BLM is concerned about the visual impacts to views in the North Steptoe Valley caused by the crossing of U.S. Highway 93A (Link 250) and the crossing of U.S. Highway 93 (Link 260). Routing around the northern tip of the Schell Creek Range (Links 259, 260) would introduce visually contrasting elements into foreground and middleground views from these highways where the Schell Creek Range and the Currie Hills (Link 250) would backdrop the proposed transmission line.

The route would continue to an alternative substation site located in the North Steptoe Valley over a mile west of U.S. Highway 93. From this substation site, the route would pass south along the western edge of Steptoe Valley (Links 270, 291) then cut southwest through Dry Canyon (Link 293) in the Egan Range. Once west of the Egan Range, the route would cross Butte Valley and enter the Robinson Summit area (Link 310), the location of a second alternative substation site in the Ely area, after crossing Nevada State Highway 50.

The route would continue on the east side of Jakes Valley (Links 340, 362, 363) into the White River Valley crossing the White River and Nevada State Highway 6 (Link 669). Just south of the Wayne Kirch National Wildlife Refuge it would cross the White River again, then turn southeast to a pass at the southern end of the Schell Creek Range (Link 672). Nellis Air Force Base has expressed concerns for low-altitude military aircraft operations where Route A would cross the Muleshoe Valley and into the north end of the Dry Lake Valley (Link 673). From the Black Canyon on the east edge of the Dry Lake Valley, the route would meet and parallel Lincoln Power's 69kV power line along the toe of the Burnt Springs Range (Link 675). The route would continuously parallel this 69kV line into Coyote Spring Valley, northeast of Las Vegas.

The route would continue into the Delamar Valley and past Delamar Lake to meet Pahranagat Wash adjacent to Maynard Lake (Link 690). From this point, the route would parallel Pahranagat Wash where several WSAs are of concern. The proximity of their boundaries cause significant routing constraints (pinch points) for several miles along Pahranagat Wash south of Maynard Lake. On the east side of Pahranagat Wash is the Delamar WSA, and on the west side is the Evergreen WSA. Although neither WSA is recommended by BLM to be designated as Wilderness, BLM is concerned about visual impacts from dispersed areas within the WSAs. The route would parallel the 69kV line, U.S. Highway 93, and the UNTP 500kV transmission line through this area. Because of these "pinch points," it may be necessary to build the SWIP and UNTP on double circuit towers for four to six miles along Pahranagat Wash and parallel to U.S. Highway 93 (from milepost 28 to milepost 34 on Link 690). If these lines were built on double circuit towers, the future White Pine Power Project (WPPP) lines would be placed on the open circuits of each line. From milepost 34 of Link 690, the SWIP and UNTP lines would be on separate single circuit structures. The SWIP route would cross U.S. Highway 93 at about milepost 38 of Link 690.

The route would then cross Coyote Spring Valley and enter a corridor established by Congress in March 1988 for the Aerojet Land Exchange (Link 700). A portion of the area east of the route in the Coyote Spring Valley was set aside by Congress in the land exchange legislation for the management of desert tortoise. There is a concern by BLM throughout this area and into Coyote Spring Valley and Hidden Valley for visual impacts to views from U.S. Highway 93. The Arrow Canyon WSA is on the east side of the route and encompasses the Arrow Canyon Range from Nevada State Highway 7 south for several miles. Along the same corridor, several Fish and Wildlife WSAs lie on the west side of the Arrow Canyon WSA (Link 700). They begin at the northern portion of the Coyote Springs Valley and continue several miles south to Hidden Valley. South of these WSAs the route would turn east through a small pass in the southern Arrow Canyon Range, just east of Hidden Valley, and into the proposed substation at Dry Lake.

Although none of the WSAs potentially affected by the route are recommended by BLM to be designated as Wilderness, BLM is concerned about the potential visual impacts to dispersed recreational users within these WSAs.

Route B: 345kV-Trout Creek-Wendover-Steptoe-Antone Pass-Dry Lake Alternative This route is the same as Route B (above) from the Midpoint Substation to south of Jackpot, Nevada (Link 72).

Just south of Salmon Falls Creek, Route B would turn sharply southeast crossing U.S. Highway 93 (Link 91) to roughly parallel Trout Creek west of the Granite Range (Link 92) and Knoll Mountain (Link 140), and then cross Thousand Springs Valley. The route would pass just west of the Ninemile Mountain (Link 141) and continue south through Toano Draw which joins the Goshute Valley west of the Pequop Mountains. The route then would cross the Goshute Valley approximately three miles northeast of Oasis, Nevada (Links 221, 222).

The route would cross Interstate 80 in Silver Zone Pass and traverse south along the eastern toe of the Goshute Mountains (Link 222). The route would also pass east of the Bluebell WSA (Link 222). Near Ferguson Mountain the route would cross U.S. Highway 93A (Link 224) then would parallel it to Lages Station, Nevada (Link 226). The BLM has expressed concerns for visual impacts from dispersed areas where this route would pass adjacent to the Goshute Peak WSA, an area recommended for Wilderness designation (Link 226).

From Lages Station south into north Steptoe Valley, the route would parallel U.S. Highway 93 then cross the highway to reach the alternative substation site at the north end of Steptoe Valley. The BLM is concerned that the route would introduce visually contrasting elements into foreground and middleground views from U.S. Highway 93 as the route passes around the northern tip of the Schell Creek Range (Links 259, 260). The Schell Creek Range would be a backdrop to the proposed transmission line in this location.

From the substation site, the route would cross the Steptoe Valley passing east of the community of Cherry Creek while parallel to a Nevada Northern Railroad right-of-way. The route then would turn southwest into Antone Pass between the Cocomongo Mountains and the Egan Range. West of this pass, the route would traverse Butte Valley and enter the Robinson Summit alternative substation site from the north.

From Robinson Summit south to its terminus in Dry Lake Valley, northeast of Las Vegas, Nevada, Route B is identical to Route A (above).

Route C: 345kV-Trout Creek-Goshute Valley-Steptoe-Egan Range-Dry Lake Alternative Route C is the same as Route A from Midpoint Substation to just south of Jackpot, Nevada.

From south of Jackpot to the vicinity of Oasis, Nevada (Link 200), Route C is the same as Route B. Then, from Oasis (Link 211), Route C is identical to Route A to the southern terminus in the Dry Lake Valley, northeast of Las Vegas, Nevada.

Route D: 345kV-Wells-Steptoe-Egan Range-Dry Lake Alternative Route D is the same as Route A from Midpoint Substation south to just north of HD Summit (end of Link 162) at southern end of Thousand Springs Valley.

From HD Summit, Route D would parallel the Upper Salmon to Wells 138kV transmission line in the narrow valley west of U.S. Highway 93 south into the northern end of the Town Creek Flats (Links 1611, 166, 167, 1613). The route would turn southeast crossing U.S. Highway 93 towards Wells Peak, cross the eastern half of the Town Creek Flats, and then pass along the northwestern toe of the Wood Hills several miles east of Wells, Nevada (Link 180). The BLM has expressed concern about visual impacts at the crossing of U.S. Highway 93 north of Wells, and the crossing of Interstate 80 about two miles west of Moor Summit.

From the Wood Hills, the route would cross the Independence Valley (Link 180) and begin paralleling a Union Pacific Railroad right-of-way (Link 190) near the center of the valley. The route would cross the Pequop Mountains over the Union Pacific railroad tunnel near Hogan and enter the Goshute Valley. The route then passes one mile east of the South Pequop WSA (Link 190), which has been recommended for Wilderness designation. A short distance after the WSA, the route would turn south-southwest and pass the town of Dolly Varden. Just south of Mizpah, the route would turn south away from the railroad and would cross U.S. Highway 93 several miles south of Currie, Nevada (Link 241). The route would pass to the east of the Goshute Canyon WSA and the adjacent Natural Area (junction of Links 241,242 & 243). Continuing south along the western edge of Goshute Lake, the route would then turn southeast to an alternative substation site located at the north end of the Steptoe Valley.

From the North Steptoe Valley (Link 270), Route D is identical to Route A south to the southern terminus in the Dry Lake Valley, northeast of Las Vegas, Nevada.

Route E: 345kV-Thousand Springs-Wendover-Steptoe-Egan Range-Dry Lake Alternative
Route E is the same as Route A from Midpoint Substation to Oasis, Nevada near Interstate 80 (refer to Route A description above).

From Oasis to the alternative substation site in the North Steptoe Valley, Route E is identical to Route B (refer to Route B description above). Route E is the same as Route A from the north Steptoe Valley south to the southern terminus in the Dry Lake Valley, northeast of Las Vegas, Nevada.

Route F: Hagerman-Trout Creek-Goshute Valley-Egan Range-Dry Lake Alternative Route F would depart Midpoint Substation to the west towards the Hagerman area crossing rural agricultural lands broken by dispersed sage scrub range areas (Link 61). Visual impacts to the many residences in the area and land use conflicts with agriculture operations in the Snake River Valley were among the concerns expressed at public meetings in the area. The route would descend the bluff into the Hagerman area just south of Malad Gorge State Park and cross the Snake River (Link 61). On the west side of the Snake River, the route would climb the steep, eroded wall of the canyon and traverse parallel to the north and west boundaries of the Hagerman Fossil Beds National Monument (Links 62, 64). The National Park Service has expressed concerns about visual impacts to the visitors' center and interpretation facilities planned for the Hagerman Fossil Beds National Monument.

As the route would turn south (Link 64), agricultural lands are avoided because the route follows a long, narrow strip of BLM lands known as Dickey Bird Lane (Link 62). BLM is concerned about the route crossing this land because of its use for vegetation and upland game research by BLM and Idaho Department of Fish and Game. From the end of Dickey

Bird Lane, the route would traverse rural agricultural lands passing near several rural residences. There is concern that the route could impact a utility airstrip used by aerial spraying operations located near the southern boundary of the Hagerman Fossil Beds National Monument.

Just north of Balanced Rock State Park, the route would cross Salmon Falls Creek Canyon and parallel the Upper Salmon to Wells 138kV transmission line along the western rim of the canyon (Link 64). The route would continue south with the 138kV transmission line roughly paralleling this canyon. East of the Salmon Falls Reservoir, the route would cross the Idaho-Nevada state line near Jackpot, Nevada (Link 70).

Route F is the same as Route B from just south of Jackpot to near Oasis, Nevada. Then from Oasis to the southern terminus in Dry Lake Valley, Nevada, this route is identical to Route A.

Route G: 345kV-Cottonwood Creek-Thousand Springs-Goshute Valley-Steptoe-Egan Range-Dry Lake Alternative Route G is the same as Route A from Midpoint Substation south to the Idaho-Nevada state line (Link 70).

West of Jackpot, Nevada the route would cross Salmon Falls Creek (Link 711) a mile west of the Upper Salmon to Wells 138kV transmission line crossing. BLM representatives from the Elko District favor this crossing over the crossings used by other routes about two miles to the south.

Route G would then continue south parallelling the west side of the Midpoint to Valmy 345kV transmission line and the 138kV Upper Salmon to Wells transmission line. Sage grouse habitat between the transmission line corridor and Grassy Mountain is of concern along this area of the route. However, cumulative effects to the sage grouse are expected to be lower where the route parallels existing transmission lines (refer to Chapter 4).

Continuing south (Link 101, 715), the route would then turn southeast to cross U.S. Highway 93 and the two existing transmission lines (Link 713) just north of Contact, Nevada. The BLM has expressed concerns about visual impacts to views from U.S. Highway 93 and residences in the Contact area. The route would continue south paralleling the two transmission lines on the east side to Rocky Peak (Links 110, 130). Then, the route would turn southeast away from the existing transmission line corridor and cross Thousand Springs Valley east of the Wilkins Ranch (Link 150, 151), and southeast into the Toano Draw.

The route would traverse the western edge of the Toano Draw (Link 200) into Goshute Valley. Along the eastern toe of the Pequop Mountains, the route (Link 211) would continue south passing just to the west of Oasis, Nevada before crossing Interstate 80. There were concerns expressed in the public workshops about visual impacts to a ranch headquarters in the Goshute Valley. In addition, the BLM has also expressed concerns about visual impacts at the Interstate 80 crossing, a designated low visibility corridor in the Wells Resource Management Plan.

The route would continue south through the Goshute Valley (Links 212, 230) parallel to an unused railroad bed passing Shafter and Dolly Varden. A little south of Mizpah, the route

would turn south away from the railroad crossing U.S. Highway 93 several miles southeast of Currie, Nevada (Link 241). The route would then pass to the east of the Goshute Canyon WSA and the adjacent Natural Area (junction of Links 241, 242 and 243). Continuing south along the western edge of Goshute Lake, the route would turn southeast to an alternative substation site located at the north end of the Steptoe Valley.

Route G is the same as Route B from this substation site to the southern terminus in Dry Lake Valley, Nevada.

Substation and Series Compensation Sites

Three new facilities would be required between Midpoint Substation and the proposed terminus in the Dry Lake Valley. A series compensation facility would be required north of Wells, Nevada. The facility near Wells could be expanded to include switching equipment if an interconnection with Sierra Pacific Power is needed in the future. This site was formerly proposed as a potential interconnection with the Thousand Springs Power Project (TSPP), which was canceled in 1991. However, Sierra Pacific has expressed interest in a transmission interconnection at this site. The second new facility would be a new substation facility in the vicinity of Ely, Nevada, to provide an interconnection point for the Ely to Delta routes (Crosstie) and potentially the 230kV transmission system already in the area. The third new facility is a new substation in the Dry Lake Valley northeast of Las Vegas, the proposed termination point for the SWIP. A fourth facility, a series compensation station, may be required in the Delamar Valley, which would require a separate environmental assessment (EA) if constructed.

In the Ely area, only one substation site would be selected for the SWIP. If a substation is developed at the Robinson Summit site, a substation may also be developed at the North Steptoe site, if the WPPP is developed in the future. If the North Steptoe substation site is developed as part of the SWIP, the Robinson Summit substation site may also be developed in the future to provide an interconnection with the 230kV transmission system in the area. However, only one substation site would be developed as part of the SWIP.

Seven facility siting areas were identified and studied between Midpoint and Dry Lake. The North Steptoe, Robinson Summit, and Hercules Gap siting areas were identified to locate a new substation in the vicinity of Ely. The U.S. Highway 93, Thousand Springs, and Goshute Valley siting areas northeast of Wells, Nevada, were identified to locate a series compensation station between Midpoint and Ely. The seventh siting area in the Dry Lake Valley northeast of Las Vegas was identified for a new substation facility and the proposed southern terminus of the SWIP.

These siting areas are shown on the route map in the map volume that accompanies this document. Environmental resource data for each of these siting areas were collected and mapped during the inventory.

Alternative facilities sites within these seven siting areas were determined through a siting process which compiled environmental and engineering data using GIS. The analysis of

these data produced environmental and engineering constraints maps that were used by project planners to determine specific alternative facility sites within each of the siting areas. Potential resource impacts for alternative facilities sites were then determined using GIS models (modified versions of those used for the alternative transmission lines routes). The selection of the specific sites was determined by a review of the environmental impacts in conjunction with the transmission line route selection process.

Among the three substation siting areas in the vicinity of Ely, a total of six alternative substation sites were identified and assessed for impacts. Of these six alternative substation sites, only two were considered environmentally acceptable:

- North Steptoe - located in the North Steptoe Valley north of McGill, Nevada, adjacent to the proposed site of the White Pine Power Project
- Robinson Summit - located just south of U.S. Highway 50 west of Ely, Nevada

Among the three series compensation station siting areas north and east of Wells, a total of seven alternative sites were identified and assessed for impacts. Because the final selection of the series compensation station site would be determined by the route selection process, one site from each series compensation station siting area was selected.

Comparative resource impacts and further description of the substation siting and impact assessment process are found in Appendix E (also refer to the technical reports for additional detailed descriptions of resource data and impacts).

Communication Facilities

A total of 16 alternative microwave communication sites were identified and studied for the portion of the transmission line from Midpoint Substation to the proposed Dry Lake substation site. Two alternative microwave communication paths have been identified (refer to Map Volume). These alternative paths depend on where the substation near Ely is sited, the North Steptoe site or Robinson Summit site.

It is possible that a fiber optic groundwire may be installed (on the towers in place of the shield wire) to facilitate communication needs for the transmission line, or capacity may be sold to commercial communication companies. If fiber access is allowed to commercial companies, they would be responsible for obtaining the necessary permits and right-of-way needed for regeneration stations at intervals along the transmission line (also refer to Right-of-Way Acquisition).

The communications path from Midpoint Substation to the Robinson Summit substation site to the proposed substation at Dry Lake would require the development of new microwave facilities at ten (10) of the alternative microwave sites studied. Of these ten sites, eight sites would be developed at locations adjacent to existing electronic facilities and two of the sites would require new construction on previously undeveloped sites. The specific microwave sites required for each of the paths are listed below, from north to south:

Robinson Summit	**North Steptoe**
Path 1	Path 2
Hansen Butte	Hansen Butte
Cottonwood	Cottonwood
Ellen D	Ellen D
Rocky Point	Six-Mile
Proctor	Spruce Mountain
Bald Peak	Long Valley
Raiff	Copper
Squaw Peak	Cave Mountain
Cave Mountain	Mount Wilson
Mount Wilson	Highland Peak
Highland Peak	

The other path would link Midpoint Substation to the North Steptoe substation site at Dry Lake and would require the development of new microwave facilities at eleven of the alternative microwave sites studied. Of these eleven sites, eight sites would be developed adjacent to similar existing facilities. Three of the sites would require new development.

The alternative microwave sites were identified based on a set engineering criteria and consideration for environmental concerns. Alternative sites were located at existing facility developments wherever possible. The locations of microwave sites are not dependent on the location of the transmission line route. Rather, they are dependent on the locations of the substations that they would control (e.g., Robinson Summit or North Steptoe).

The importance of the microwave facilities is to provide a communications link between substation, series compensation station, and switching facilities in the transmission line system. The microwave system provides the transmission line with a highly reliable and secure communication circuit for protective relaying, voice communications, telemetering, and supervisory control and data acquisition (SCADA).

Potential resource impacts for each site and additional environmental data are summarized in Appendix F of this document. Also refer to the technical reports under each resource for additional information on data inventory and potential impacts.

Ely to Delta

Transmission Line Alternatives

Four major routing alternatives were developed on the crosstie portion of the SWIP (east-west segments) from the Ely area to the Delta area:

- **Direct Route** - is comprised of link segments:

  262, 263, 265, 266, 620, 621, 630, 640, 572, 580, 581, 582

- **Cutoff Route** - is comprised of link segments:

  262, 263, 265, 266, 267, 268, 462, 470, 540, 571, 572, 580, 581, 582

- **230kV Corridor Route** - is comprised of link segments:

  350, 351, 352, 370, 380, 460, 461, 462, 470, 540, 571, 572, 580, 581, 582

- **Southern Route** - is comprised of link segments:

  340, 362, 364, 420, 430, 450, 451, 490, 510, 560, 571, 572, 580, 581, 582

The following section describes various issues and resource preferences for each route. Comparative environmental data are summarized in Table 2-5.

Direct Route - The Direct Route would connect to the north-south SWIP transmission system at the North Steptoe substation. It would cross east of this area through the Schell Creek Range at the Dry Canyon, and into the Spring Valley. The route would cross the creek and continue southeast past Twelvemile Summit, Red Hills, and Mike Springs Wash, and then just north of the Little Hills.

The route would continue east through the Tin Springs Mountain, and would continue east parallelling the Juab-Millard County lines in Utah. The route would cross into the Snake Valley on the south end of the Deep Creek Range. In the middle of Snake Valley the route would cross the Leland-Harris Spring Complex, which is known to have several sensitive species of fish, the spotted frog, and a butterfly species. BLM is extremely concerned about the potential for increased public access into this area through road construction or upgrading. BLM would request emergency listing with Fish and Wildlife Service (FWS) of at least four species as threatened or endangered under the Endangered Species Act (1974) if this route is selected.

The route would continue east crossing through the Confusion Range and into Tule Valley south of the Middle Range. The route from the Nevada-Utah state line would be within the R-6405 Restricted Area of the Utah Training and Testing Range (UTTR) of Hill Air Force Base (AFB). Hill AFB is extremely concerned about their low-level flying missions through this entire area, and especially within the valleys. The high level of concern is amplified due to the current round of base closures throughout the U.S. Hill AFB is not scheduled to be closed. If the SWIP is constructed on this route, Hill AFB is requesting that it be designed and built at a height that is lower than would be technically feasible.

The route would then continue east, passing south of the Fish Springs WSA (Link 630) and north of the Swasey Mountain WSA near Swasey Point. It would then pass on the north end of the House Range and continue southeast between the Drum Mountains and Little Drum Mountains. The route would again turn straight east and passing south of the Drum

Mountains and just north of Greener Reservoir. The last twelve miles into the Intermountain substation site would parallel the IPP to Adelanto 500kV DC line.

Cutoff Route - The first segment of the Cutoff Route from the North Steptoe substation to just east of the Little Hills is the same as the Direct Route (refer to above section). From here the route would pass across the north and east sides of Government Peak in the Little Valley. At this point the line would turn south and cross through the edge of the restricted area of the UTTR. If the SWIP is constructed on this route, Hill AFB is requesting that shorter towers be constructed in specified areas to reduce the potential for conflict with low-level flying on the UTTR.

As the route proceeds southeast it would cross Snake Valley and into Coyote Pass in the Conger Range approximately three miles from the Marble Canyon WSA and Mount Moriah Wilderness area. BLM is concerned about the visual effects from dispersed areas within both of these areas.

At this point the route would join the route of the two existing 230kV transmission lines (Gondor-IPP, Gondor-Pavant) passing east through Sheepmens Little Valley and Payson Canyon. The route would cross Tule Valley as it continues east, then through Marjum Canyon between the Howell Peak and the Notch Peak WSAs. BLM is also concerned about the potential visual effects to these WSAs.

The 230kV corridor splits just east of Marjum Canyon. The SWIP route would follow the Gondor to IPP 230kV route northeast across the Whirlwind Valley to the south end of the Little Drum Mountains. It would continue along this corridor joined by the IPP to Adelanto 500kV DC line into the Intermountain Generating Station.

230kV Corridor Route - This route would begin at the Robinson Summit substation site and cross east into Smith Valley just south of the Hercules Gap. The route would continue east across U.S. Highway 93 before joining with the two existing 230kV transmission lines that make up this existing corridor. The corridor would cross east of Ely and enter the Humboldt National Forest in Cooper Canyon.

The corridor would continue east across Spring Creek and cross the Snake Range in Weaver Creek, just north of Great Basin National Park. There are concerns expressed by the National Park Service and the public about potential visual effects to Great Basin National Park. These concerns include background views from the proposed visitors' center and other proposed scenic vista sites. Outside the park boundaries there are also concerns for park visitors' views while driving to or away from the park along the major access routes and views from the proposed wayside stations near Sacramento Pass and near the Utah-Nevada border. The location of these wayside stations have been identified in Great Basin National Park's Draft General Management Plan, but have not been finalized. They are included for purposes of analysis in this EIS only.

The corridor would cross U.S. Highway 6/50 twice in this area, and then continues east across the Snake Valley. The route would cross south of Eskdale and into the Buckskin Hills. From here this route follows the 230kV corridor as described above for the Cutoff Route. If

the line is constructed along this route, Hill AFB is requesting that shorter towers be constructed to reduce the potential for conflict with low-level flying on the UTTR.

Southern Route - The route would head south from the Robinson Summit substation site along the east side of the Jakes Valley, south of Duck Peak, and across the White River Valley. It would cross the Egan Range in Water Canyon and Williams Creek, and then would cross Cattle Camp Wash in the south end of the Steptoe Valley, and north of the Cattle Camp Spring and the Burnt Knoll Spring.

It would then cross into the Spring Valley north of the Fortification Range. It would follow across the south end of the Snake Range south of Big Spring, then across the north end of the Mountain Home Range.

In the Antelope Valley Wash, the route would cross Utah State Highway 21 adjacent to the proposed site of a wayside interpretive site (location has not been finalized and is for SWIP analysis only) for the Great Basin National Park. The route would continue northeast through Cowboy Pass, then turning east across the Ferguson Desert north of the Wah Wah Mountains WSA and on through Snake Pass. The route would then pass just south of the King Top WSA and turn sharply north into the Tule Valley at a point south of the Barn Hills. The route would turn to the northeast in Tule Valley and pass south of the Notch Peak WSA near Skull Pass and would cross the Sevier Desert north of Sevier Lake to join the IPP to Adelanto 500kV DC transmission line to the Intermountain Generating Station. Hill AFB has expressed concerns about potential conflicts with low-level flying operations conducted in the UTTR. Shorter towers would be required along several portions of this route with the UTTR.

Substation and Series Compensation Station Areas

Two new substations would be required for the east-west transmission line from Ely to Delta. One of these substations would be located in the Ely, Nevada area (previously described under the Midpoint to Dry Lake section on page 2-44). The other substation site would be located near IPP. Three substation siting areas were identified in the vicinity of Delta, Utah:

- Sevier - this siting area is located at the north end of the Cricket Mountains near the Old Sevier River, northeast of Sevier Lake
- Smelter Hills - this siting area is located near the Smelter Hills about 15 miles west of Delta, Utah
- Intermountain - this siting area is located adjacent to the Intermountain Generating Station

These siting areas are shown on the route map in the map volume that accompanies this document. A total of four alternative substation sites were identified within these three siting areas. These alternative sites were determined through a siting process which compiled and analyzed environmental and engineering data using GIS, as described previously. Each of these alternative sites was assessed for potential impacts. The selection

of a preferred site was determined through an analysis of the potential environmental impacts in conjunction with the transmission line route selection process.

The siting process, inventory, and the impact assessment are described in Appendix E. In addition, potential resource impacts for each of the alternative substation sites are described in the supporting technical reports.

Communication Facilities

The Ely to Delta portion of the SWIP route would use an existing microwave communications system. LADWP currently operates a microwave system between Ely and Delta for the Gondor to IPP 230kV transmission line. Each of these existing microwave facilities would require some modifications (e.g., new equipment). However, these modifications are not expected to require any ground disturbing activities.

IDENTIFICATION OF PREFERRED ALTERNATIVES

Environmentally Preferred Alternatives

Midpoint to Dry Lake

Routes A and E would have the fewest miles of high visual impacts, however, both of these routes would have a large number of miles of moderate visual impacts. Route A also has the second lowest number of miles of high biological impacts. Route A is the environmentally preferred route. Refer to the Alternative Routes map in the Map Volume for Route A through G locations.

Routes B and E are two of the longer routes because they both pass east of the Goshute Mountains. As a result, Route B would have the most miles of high biological impacts, while Route E would have more mileage of moderate impacts to all resources than the other alternative routes.

Although Route C would have the fewest miles of high cultural impacts, this route and Route B would have large numbers of miles of high biological impacts. Both of these routes would disturb sage grouse habitat and leks in the area from Trout Creek to Thousand Springs Valley (Links 91, 92, 140, 141, 142, and 144), which cause the biological impacts for these routes to be somewhat higher than the other alternative routes.

Route G would have the largest mileage parallel to existing transmission lines and would also best use BLM utility corridors. Routes B, C, and F are outside BLM utility corridors where these routes pass through the Trout Creek area into the Thousand Springs Valley, while Routes A, C, D, E, and F are outside BLM utility corridors where they cross the Egan

Range through Dry Canyon. Routes C and F would have the greatest mileage outside BLM utility corridors.

Route F, the only route that uses the western links in Idaho, would be the longest of the alternative routes. Because Route F traverses more rural agricultural lands and passes adjacent to the new Hagerman Fossil Beds National Monument, this route has the greatest mileage of high visual impacts to sensitive viewpoints, and therefore would not be environmentally preferred.

Although Route G is the shortest route, it would have the second greatest mileage of high biological impacts. Construction in undisturbed sage grouse habitat in areas south of Jackpot and in Toano Draw contribute to these biological impacts. In addition, Route G has a large number of miles of high visual impacts. For these reasons, Route G also would not be environmentally preferred.

Route D does not pass through the area previously proposed as the Thousand Springs Power Project (TSPP) site, and therefore would not integrate potential regional resources with the SWIP as well as the other routes. The TSPP has been canceled. The final EIS on the project was not released. Should a project be proposed for this site in the future it would be important for regional integration with the SWIP.

Although impacts would not be particularly significant, the BLM has expressed considerable concern for Route D where it passes near Wells, Nevada and for the potential of wet soils and standing water occurring at certain times of the year in the Independence Valley.

In summary, Routes A, C, D, and E would have resource impacts that are very similar. Routes A and D both would better use existing BLM utility corridors. However, Route D would not adequately accommodate the integration of future resources if TSPP or another generation project is developed in the Toano Draw. Subsequently, Route A is the environmentally preferred route between Midpoint Substation and the proposed substation in Dry Lake followed closely by Routes C, D, and E.

The alternative substation sites at Robinson Summit (Sites #9 or #10) are very similar environmentally and there is no distinctive preference (also refer to Appendix E). Site #8 is the only substation site identified within the North Steptoe substation siting area, and therefore would be the preferred environmentally. The alternative substation sites within the Hercules Gap substation siting area is the least preferred substation area for the Midpoint to Dry Lake alternative routes due to potential wetland problems on Link 292 and visual impacts to residences for both Sites #11 and #12. The preference between the alternative substation siting areas is determined mainly by the environmental preference of the routing alternative in or out of the substation site. Therefore, the preferred substation site is either #8 (if Cutoff Route is selected) or #9 or #10 (if the 230kV Corridor Route is selected).

The environmental preference for the U.S. Highway 93 series compensation station siting area (used if Route D is selected) is Site #1, but is only slightly preferred over Site #2, mainly due to cultural resource concerns. The environmental preference for the Thousand Springs series compensation station siting area (could be used if Routes B, C, or F are selected) would be Site #5 due to fewer potential effects to sage grouse. There is a slight environmental

preference for Site #6 within the Goshute Valley series compensation station siting area (could be used if Routes A, B, C, E, F, or G are selected), due to lower cultural resource and flood zone concerns. Therefore, the preferred series compensation site is #6, followed closely by Site #5 (if Route C is selected) or site #1 (if Route D is selected)(also refer to Appendix E).

The final selection of a substation in the Dry Lake area would depend on the routing decision for the future Marketplace-Allen Transmission Project (MAT) proposed by Nevada Power Company (NPC) to connect from this area south to the area of the McCullough Substation. In 1990 BLM asked IPCo to coordinate the transmission needs through this area with the other regional utilities. Subsequent discussions with NPC and other utilities resulted in the MAT project being proposed.

Although the Mat would be operated by NPC, several other regional utilities would likely be participants in the project. Once completed the MAT would provide a major electrical interconnection point for the inland southwest, with connection points on its north end (Dry Lake substation) and south end (new marketplace substation near McCullough Substation). The approximately 53 mile MAT project would consist of two 500kV lines with a combined capacity of 3000-3500 megawatts. This high capacity rating is possible because of the relatively short distance between the two proposed marketplace substations. The high capacity of this system would allow the planned transmission lines to connect on either end, while minimizing the number of lines through this sensitive area. The MAT is proposed to be in service in 1997.

There are two major potential routing alternatives for this project. The first would run straight south through the Apex development parallel to the proposed Utah-Nevada Transmission Project 500kV line, then cutting southeast to the Gypsum Wash area, then south through Sunrise Mountain and Henderson areas. The second major routing alternative would cross Interstate-15 at the north end of the Dry Lake range and run straight south paralleling the IPP-Adelanto 500kV DC line and the Navajo-McCullough 500kV line to the Sunrise Mountain and Henderson areas.

In the proposed Dry Lake substation siting area, all of the potential substation sites are environmentally acceptable. Substation Sites 17 and 18 are the preferred sites if the route south to MAT travels on the east side and south of the Dry Lake range. Substation sites 18 and 20 are the preferred sites if the route south to MAT travels south through the Apex development (also refer to Appendix D and E).

There are also no distinctive environmental preferences for the communication path for the Midpoint to Dry Lake alternatives.

The mileage of selectively committed mitigation for the environmentally, agency, and utility preferred routes are documented Table 2-6.

Ely to Delta

The Direct Route (refer to the Map Volume) would be the shortest route for the crosstie routes from Ely to Delta. The major concern for this route, which crosses lands with restricted air space, has been expressed by Hill AFB. Hill AFB is opposed to any structures exceeding 35 feet high through the area of restricted air space along this route. Because this route crosses largely uninhabited public lands, there are fewer significant visual effects. However, both the public and the BLM have expressed serious concern for protecting the undisturbed landscape through which the route passes and other potentially unknown (e.g., cultural sites) or not understood resources (e.g., Leland Harris Spring complex). Because of these high concerns for the Leland Harris spring complex and military aircraft operations in the Hill AFB's R-6405 Restricted Area, the Direct Route is less preferred environmentally than the Cutoff Route.

The Cutoff Route (refer to the Map Volume) generally crosses public lands through areas that are mostly uninhabited. Visual impacts are slightly higher than the Direct Route, although the visual impacts are the same in the common portions of the two routes through Spring Valley and the Little Hills area. This route has a similar total mileage of biological resource impacts as the Direct Route. It would also use the existing 230kV corridor for about half of its length. Hill AFB has requested that towers crossing through specific areas of the military operating areas (MOAs) along this route be restricted to a maximum tower height of 105 feet above the ground level. To meet this request while maintaining ground-clearance requirements, the distance between towers would typically be less, and more towers would be required through these areas.

The 230kV Corridor Route (refer to the Map Volume) would have about the same mileage of significant visual impacts as the Cutoff Route. These significant visual impacts are generally associated with rural residences (e.g., Ely, Hercules Gap, and Sacramento Pass), U.S. Highway 6/50, and both existing and planned recreation viewpoints along the route. Because it follows existing transmission corridors for its entire length the 230kV Corridor Route best satisfies the Federal Land Policy Management Act of 1976 (FLPMA) mandate to "consolidate corridors" where possible. This route also crosses through MOAs of the UTTR of Hill AFB. The cumulative environmental effects of the future WPPP transmission system would not be significantly different regardless of whether the 230kV Corridor Route or the Cutoff Route is selected. Refer to Chapter 4 for a further discussion on cumulative effects.

The Southern Route (refer to the Map Volume), the longest crosstie route, has substantially more miles of high cultural and biological impacts than the other crosstie (Ely to Delta) routes. This route also has the second largest mileage of high visual impacts. Because of the Southern Route's greater length and significant impacts, it is the least environmentally preferred of the crosstie routes.

In summary, because of the concerns for the Leland-Harris Spring Complex and the restricted air space of the UTTR for the Direct Route, the Cutoff Route is the environmentally preferred route. However, the 230kV Corridor Route would also be an environmentally acceptable alternative, and is quite similar environmentally to the Cutoff Route. If the Robinson Summit substation site is developed, the 230kV alternative route would be considered

environmentally preferred because of the additional miles of transmission system needed to connect the North Steptoe substation site to the Robinson Summit substation site.

The environmentally preferred substation site (Site #14) in the Delta area is located in the Intermountain substation siting area, and is preferred primarily due to lower visual impacts from its proximity to the Intermountain Generating Station. The alternative substation sites at Robinson Summit (Sites #9 or 10) are very similar environmentally and there is no distinctive preference. Site #8 is the only substation site identified within the North Steptoe substation siting area, and therefore would be the preferred, environmentally. The substation site at Hercules Gap is the least preferred of the substation sites for the Ely to Delta alternative routes due to visual impacts to residences and travel routes. The preference between the alternative substation siting areas is determined mainly by the environmental preference of the routing alternative in or out of the substation site. Therefore, the preferred substation site is #14 in the Delta area and either #8 (if Cutoff Route is selected) or #9 or #10 (if the 230kV Corridor Route is selected). Refer to Appendix E for additional information on substations and series compensation stations.

There are no new communication facilities anticipated for the crosstie routes.

Mitigation commitments for the environmentally, agency, and utility preferred routes are documented in the Mitigation Summary in Table 2-6.

Utility Preferred Alternatives

Midpoint to Dry Lake

IPCo's preferred alternative route from Midpoint to Dry Lake is based primarily on economic considerations and transmission system reliability. IPCo agrees with most segments of the environmentally preferred alternative with one localized route variation.

This variation is the preference of Links 242 and 244 over Links 243, 245, and 261. Route G, as defined in this area, would result in unnecessary additional distance to provide an interconnection to the North Steptoe substation site. If Robinson Summit is developed, and WPPP is developed in the future, a short tap could be constructed to interconnect the two facilities. If the WPPP is not developed, the construction of additional miles of line now would be an unneeded cost and would cause additional environmental impacts. However, if North Steptoe substation site is developed, IPCo recognizes that constructing Links 243, 245, and 261 would be prudent over Links 242 and 244.

IPCo recognizes that the North Steptoe and Robinson Summit substation sites are both environmentally viable, and that the third substation site near Hercules Gap, would have significant environmental issues if developed. Of the two acceptable substation sites, IPCo prefers the Robinson Summit substation site.

The owners of an existing 230kV transmission system in the area have expressed interest in a future interconnection with the SWIP. This potential interconnection with a 230kV system at the Robinson Summit substation site would facilitate developing the Ely area into an open marketplace substation. The owners of the existing 230kV system would not likely choose to extend their 230kV system north to the North Steptoe substation site. Therefore, the construction of the substation at North Steptoe may not eliminate the need for a future substation at Robinson Summit. If Robinson Summit is developed the SWIP line would be designed to accommodate a possible future interconnection with the WPPP.

IPCo selects Route G as the preferred alternative route from Midpoint to North Steptoe with several important variations. The first variation is that Link 102 is selected over the combination of Links 715 and 713 in Route G just north of Contact, Nevada. The SWIP would cross over the Upper Salmon-Wells 138kV line on the northern end of Link 102. The route needs to stay on the west side of the existing 345kV line until the southern end of Link 102, where it would then cross. Using Links 715 and 713 would make it difficult and more costly to cross the two existing lines.

The second important variation from Route G would occur if the Robinson Summit substation site is developed over the North Steptoe site. This would be the selection of Links 242 and 244 over Links 243, 245, and 261. Route G would provide unnecessary additional distance to provide an interconnection to the North Steptoe substation site. If Robinson Summit is developed, and WPPP is developed in the future, a short SWIP line tap could be constructed to interconnect the two facilities. If WPPP is not developed the construction of additional miles of line now would be an unneeded cost and would cause additional environmental impacts. However, if the North Steptoe substation site is developed, IPCo recognizes that constructing Links 243, 245, and 261 would be prudent over Links 242 and 244.

Route G is selected as the utility preferred route by IPCo from Robinson Summit south to Dry Lake. Route G is the same as Route A (the environmentally preferred route) for this segment.

Additional documentation of IPCo's preferred route is in the SWIP project files.

Mileage of selectively committed mitigation for the environmentally, agency, and utility preferred routes are documented in Table 2-6.

Ely to Delta

LADWP, the constructing and operating agent for the crosstie routes from Ely to Delta selects the 230kV Corridor Route as the utility preferred alternative for the reasons stated in the discussion below. The main criteria used by LADWP for their selection of the utility preferred route was system reliability and construction and operation costs. They also considered environmental preferences and the political aspects of each route.

Engineering, material, and construction costs are directly related to the length of the transmission line. Although the Direct Route is nearly 24 miles shorter than the Cutoff Route, 30.7 miles shorter than the 230kV Corridor Route, and 80.9 miles shorter than the Southern Route, the military issues with the restricted air space and the uncertain environmental issues of the Direct Route cause this alternative to be the least desirable alternative.

The impacts to the MOAs have been discussed with the military and can be acceptably mitigated with the use of 105 feet maximum height towers in specified areas of concern. However, as pointed out above, the Direct Route crosses through restricted airspace as well. The military is opposed to any structures over 30 feet maximum height in the Restricted R-6405 Area. It would not be possible to meet the military's wishes and maintain economic or engineering feasibility, or NESC safety criteria.

LADWP preference to construct the proposed line along the 230kV Corridor Route best meets the mandate of the FLPMA to consolidate corridors to the degree possible, and also reflects LADWP's commitment to minimize environmental impacts whenever possible even at reasonable increased project costs. The reliability of the interconnected system would not be impacted by the operation of the proposed 230kV Corridor Route because of the substantial difference in capacity between the existing 230kV lines and the proposed SWIP crosstie line (Ely to Delta). In addition, this configuration would allow for routine line patrol and maintenance on both the 230kV system and the 500kV system simultaneously.

Also, because it is expected that the Midpoint to Dry Lake portion of the SWIP would be constructed before the WPPP or the Ely to Delta portion of the SWIP, and market access is closer to the existing 230kV lines, it is appropriate until the WPPP is built to locate a potential 500/230kV "marketplace" substation at Robinson Summit (also refer to page 2-49).

Additional documentation of LADWP's preferred route is in the SWIP project files.

Mileage of selectively committed mitigation for the environmentally, agency, and utility preferred routes are documented in Table 2-6.

Agency Preferred Routes

The various offices of BLM, representatives from the Humboldt National Forest, and Great Basin National Park met on June 18, 1991, to select a preferred routing alternative for the SWIP. Criteria considered and used to select the agencies' preference include:

- provide capacity for future utilities
- minimize new access roads needed for construction and operation
- consider public preferences expressed throughout the process
- avoid agricultural lands to the degree possible
- use existing utility and planning corridors
- minimize visual impacts

- minimize impacts to environmental resources (e.g., wildlife, cultural and historical resources)
- minimize conflicts with military airspace
- allow for good transmission system reliability

Midpoint to Dry Lake

The agency preferred route is a combination of Route A and Route G for the Midpoint to Dry Lake portion of the line. Following are the reasons for selecting these routes.

For the segment between Midpoint Substation and the Idaho-Nevada state line, Links 10, 20, 40, 41, 50, and 70 were selected. These link segments would parallel the Midpoint to Valmy 345kV transmission line to the Idaho - Nevada state line. Links 10, 20, 40, 41, and 70 would be on the west and north sides of the existing 345kV line. The assumed centerline of all these links could be easily accessed for construction and operation by existing roads, and would minimize impacts to agricultural uses. Link 20 would avoid direct conflicts with feed lots and several farm structures along Link 30.

From the Idaho-Nevada state line south to the proposed North Steptoe substation site, the agency preferred route would use Links 711, 714, 101, 715, 713, 110, 130, 150, 151, 200, 211, 212, 230, 241, and 242. Visual impacts would be reduced at the crossing of Salmon Falls Creek on Link 711. Link 101 would parallel the existing 138kV line to the west, and would minimize visual impacts from U.S. Highway 93. Links 713 and 110 cross U.S. Highway 93 in a location that would also minimize visual impacts. Link 130 parallels Upper Salmon to Wells the existing 138kV line, and would be the approximate location of the crossing of the existing 345kV line from the west side to the east side. Links 150 and 151 utilize the BLM "planning" corridor. Link 211 uses a better crossing of Interstate 80 than the existing designated BLM utility corridor. Links 212, 230, and 241 follow the BLM designated utility corridor from the Wells Resource Management Plan.

The remainder of the route south to Dry Lake is the same as the environmentally preferred route (refer to the previous section, Environmentally Preferred Alternative).

Mileage of selectively committed mitigation for the environmentally, agency, and utility preferred routes are documented in Table 2-6.

Ely to Delta

The agency preferred route for the Ely to Delta portion of the SWIP is the 230kV Corridor Route. Because the 230kV Corridor Route parallels two existing 230kV transmission lines for its entire length, this route best meets the agency criteria and Section 503 of FLPMA of utilizing existing utility corridors to the degree possible. The use of the existing utility corridor by the 230kV Corridor Route also complies with the direction in the BLM's House Range Resource Management Plan (RMP), the Warm Springs RMP, and the Schell

Management Framework Plan (MFP). Because the 230kV Corridor Route and the Cutoff Route have similar environmental impacts (refer to environmentally preferred route discussion above and Table 2-4) and this route best fulfills FLPMA's mandate to consolidate corridors where possible, the BLM favors the 230kV Corridor Route as the agencies' preferred routing alternative.

Also because of the comment letters received on the various SWIP newsletters and from comments received during the series of public meetings held during the EIS process (refer to Chapter 5), the BLM favors the placement of new lines in existing utility corridors to minimize adverse impacts and to maintain open space values in previously undeveloped areas. The Southern Route and Delta Direct Route were least favored by the public. The Cutoff Route was favored by some of the public because it would be in more remote areas and would not be seen by tourists and visitors to Great Basin National Park. However, the BLM favors avoiding the Cutoff Route, which would pass through areas that are largely undisturbed.

Concerns expressed about the Cutoff Route include resource impacts to biological, cultural, land uses, and visual resources. The public concerns about the 230kV Corridor Route include proximity to homes, health effects, land uses (e.g., agricultural lands near Silver Creek), property value impacts, and visual impacts from Great Basin National Park viewpoints. Because of concern for visual impacts to the park and to visitors driving to the park, Great Basin National Park favors the Cutoff Route (refer to Chapter 4).

Mileage of selectively committed mitigation for the environmentally, agency, and utility preferred routes are documented in the Mitigation Summary in Table 2-6.

CHAPTER 2

TABLES

TABLE 2-1

Design Characteristics of the 500kV Transmission Line

Line Length	
• Midpoint - Ely - Dry Lake	approximately 500-530 miles
• Ely - Delta	approximately 130-200 miles
Type of Structure	Steel-lattice, guyed towers Tubular-steel, H-frame towers Self-supporting, steel-lattice towers
Structure Height	Average 120 to 130 feet (range 90 to 160 feet)
Span Length	1,000 to 1,500 feet average ruling span
Number of Structures Per Mile	3 to 5
Right-of-Way Width	200 feet
Land Temporarily Disturbed:	
(1) Tower Base:	
• steel-lattice, guyed	200 X 200 feet (0.9 acre)
• tubular-steel, H-frame	200 X 200 feet (0.9 acre)
• self-supporting, steel-lattice	200 X 200 feet (0.9 acre)
(2) Wire-Pulling Sites	200 X 200 feet (0.9 acre) per 2 miles
(3) Wire-Splicing Sites	20 X 50 feet (0.02 acre) per 2 miles
(4) Construction Yards	400 X 540 feet (5 acres) per 20 to 30 miles
(5) Batch Plants	1 to 2 acres per 20 to 30 miles
Land Required Permanently:	
(1) Tower Base:	
• steel lattice guyed	125 X 125 feet approximate dimensions to guy anchors
• tubular steel H-frame	20 X 50 feet approximate dimension
• self-supporting steel lattice	50 X 50 feet approximate dimension
(2) Access Roads (average acres per mile of transmission line):	
• New Roads Required	2.0 acres
• Upgrade Existing Roads	1.5 acres
• Use Existing Roads	0.5 acre

Table 2-1 (continued)
Design Characteristics of the 500kV Transmission Line

Voltage	500,000 volts AC
Capacity	1200 MW
Circuit Configuration	Single circuit per structure, three-conductor bundle, (2 or 3 LADWP) per phase with three phases, horizontal configuration
Conductor Size	1781 kcmil (1.602 in. diameter) ACSR (Midpoint to Dry Lake) 2312 kcmil (1.802 in. diameter) ACSR (Ely to Delta)
Maximum Anticipated Electric Field at Edge of Right-of-Way	2.0kV/meter
Magnetic Field at Edge of Right-of-Way	200 milli-Gauss (mG)
NESC Standard for Ground Clearance of Conductor	31 feet minimum at 176° F
Tower Foundations	Drilled piers - cast-in-place concrete or pre-cast pads or inserts

CHAPTER 2

TABLE 2-2

Design Characteristics of a Substation and Series Compensation Site

	SUBSTATIONS	SERIES COMPENSATION
Site Size (approx.)	80 acres	15-20 acres
Equipment	•transmission line takeoff structures •power circuit breakers •power transformers •switches equipment •buswork or bus conductor •control house	•electrical towers •series capacitor banks •switching equipment •bus conductors •control house
Access Road		
• right-of-way width	20′	20′
• road Surface	gravel	gravel
• grading	heavy road base to support larger equipment	
Power Source For Construction	Yes, 50 kilowatts	Yes, 50 kilowatts
Fire Protection Facilities	fire wall barriers for protection from transformers	
Building	2200 square feet	1500 square feet
Slopes/Drainage	0.5-1 percent	0.5-1 percent
Substation/Series Compensation Grounding	Use copper wire for personnel safety and grounding	Use copper wire for personnel safety and grounding

CHAPTER 2

Table 2-2 (Continued)
Design Characteristics of a Substation and Series Compensation Site

	SUBSTATIONS	SERIES COMPENSATION
Land Temporarily Disturbed	Site specific, all work done within fenced area	Site specific, all work done within fenced area
Land Permanently Disturbed	Site specific grading and drainage, within enclosed area	Site specific grading and drainage, within enclosed area
Voltage	Multiple voltages, can change current from 500kV to 230kV	500kV single voltage

500kV Transmission Station
Electrical Requirements and Ratings

Transfer Capacity - 1500 MVA
Operating Voltage Range - 475-525kV, rms
Bus Capacity @ 525kV, 1650 Amps
Basic Insulation Levels (BIL) - 1500kV for bus support insulation
1800kV for bushings and switch gaps
Phase-to-phase clearances (metal-to-metal) 20-28 feet
Phase-to-ground clearances (metal-to-metal) 10-12 feet
Phase-to-ground clearances (personal Safety) 23 feet minimum
Phase-to-ground clearances (station roadways) 40 Feet minimum

TABLE 2-3

Construction Work Force and Equipment

Road Construction - 10 people (including maintenance)

equipment:	2 bulldozers (D-6 or D-8)
	2 motor graders
	2 pickup trucks
	2 water trucks (for construction and maintenance)

Footing Installation - 20 people

equipment:	2 hole diggers
	1 bulldozer (D-6)
	1 truck (2 ton)
	6 concrete trucks
	6 hydro crane (15 ton)
	2 pickup trucks
	2 carry alls
	1 batch plant
	2 dump trucks
	2 wagon drills

Structure Steel Haul - 10 people

equipment:	6 steel haul trucks
	1 yard crane (heavy duty)
	2 pickup trucks

Structure Assembly - 20 people

equipment:	4 carry alls
	4 pickup trucks
	4 cranes (rubber tired)
	4 trucks (2 ton)

Table 2-3 (continued)
Construction Work Force and Equipment

Survey - 6 people		
	equipment:	1 helicopter 2 pickups
Structure Erection - 10 people		
	equipment:	2 cranes (60 ton) 2 pickup trucks 2 trucks (2 ton)
Conductoring - 40 people		
	equipment:	1 helicopter and fly ropes 3 drum pullers (1 light, 1 medium, 1 heavy) 2 splicing trucks 2 double-wheeled tensioners (1 light, 1 heavy) 6 wire reel trailers 2 diesel tractors 1 crane (2-4 ton) 1 sagging equipment 4 trucks (5 ton) 6 pickup trucks
Clean-up - 12 people		
	equipment:	2 pickup trucks 2 trucks (2 ton)
Road Rehabilitation - 4 people		
	equipment:	1 bulldozer (D-8) 2 motor graders 1 pickup truck

TOTAL PERSONNEL REQUIRED - 150*

*more than 1 contractor may be used simultaneously on difference line segments

2 of 2

TABLE 2-4

Route Comparison Table - Midpoint to Dry Lake Routes

	Route A*	Route B	Route C	Route D	Route E	Route F	Route G	Utility	Agency
Construction Access Levels (miles crossed)									
Agricultural lands	16.8	16.8	16.8	16.8	16.8	22.0	16.8	16.8	16.8
Existing access with spur roads	211.0	215.1	208.1	212.6	213.1	210.7	207.0	206.8	201.9
New access roads in flat (0-8%) terrain	152.5	130.1	151.0	155.6	134.2	157.0	163.2	162.7	165.3
New access roads in rolling (8-35%) terrain	92.4	109.1	91.4	89.6	111.4	89.4	85.1	84.8	86.1
New access roads in steep (35-65%) terrain	40.3	45.0	39.6	38.9	48.2	36.9	32.6	30.5	33.0
NATURAL ENVIRONMENT									
WILDLIFE (miles crossed)									
Desert tortoise habitat	52.1	52.1	52.1	52.1	52.1	52.1	52.1	52.1	52.1
Bald eagle nesting	15.3	32.8	16.3	5.8	18.2	16.3	19.6	19.6	6.0
Peregrine falcon	0	23.1	0	0	23	0	0	0	0
Ferruginous hawk nest	1.3	1.4	1.3	1.3	1.3	1.3	1.4	1.4	1.3
Sage grouse leks or winter range	35.2	36.8	30.7	34.1	36.3	32.8	40.6	42.2	37.2
Crucial Elk habitat	0	0	0	0	0	0	0	0	0
Bighorn sheep habitat and movement corridor	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Crucial pronghorn habitat	24.1	7.2	16.2	34.9	18.6	16.5	39.7	39.7	43.2
Crictical Mule deer habitat	22.8	27.4	24.4	25.1	25.8	24.4	22.7	22.7	22.7
VEGETATION (miles crossed)									
Rare plants	1.3	1.3	1.3	1.3	1.3	4.2	1.3	1.3	1.3
Grasslands	109.1	97.3	96.3	97.3	116.3	110.2	97.8	98.6	104.8
Sage scrub	314.3	331.2	320.6	319.8	320.0	317.4	312.4	308.8	303.9
Mojave desert scrub	55.8	55.8	55.8	55.8	55.8	55.8	55.8	55.8	55.8
Woodland/mountain shrub/grasses	3.6	4.1	3.7	3.6	3.6	1.9	4.1	4.1	3.7
Riparian	3.2	3.2	3.7	5.3	3.3	3.8	4.8	4.5	5.1
*EARTH RESOURCES (miles crossed, except as noted**)*									
Prime/Unique farmland	21.4	21.2	21.2	21.4	21.4	32	21.1	21.1	21.1
High water erosion potential soils	39.0	53.1	44.4	35.5	48.6	47.8	36.4	36.4	37.3
High wind erosion potential soils	58.8	58.9	58.8	52.1	64.3	73.3	46.7	44.1	49.5
Flood hazard areas	6.2	1.2	2.1	3.1	4.1	1.8	3.1	3.1	3.1
Landslide hazard areas	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0
High paleontological sensitivity areas	23.8	38.6	35.3	21.9	25.5	37.4	30.6	19.4	20.5
Number of springs within 1/2 mile of route**	42	20	20	45	17	17	45	45	45
Number of perrenial streams crossed**	26	27	23	22	22	8	27	20	20

* Environmentally Preferred Route

Note: Totals for the Utility and Agency preferred routes vary from Route G because several different alternative routes segments are used (refer to p. 2-54).

	Route A*	Route B	Route C	Route D	Route E	Route F	Route G	Utility	Agency
HUMAN ENVIRONMENT									
LAND JURISDICTION (miles crossed)									
Bureau of Land Management	412.5	413.6	397.1	409.6	430.0	406.1	414.5	409.4	409.9
Forest Service	0	0	0	0	0	0	0	0	0
State	5.2	5.2	5.2	5.2	5.2	2.3	5.2	5.2	5.2
Private	95.2	97.3	104.6	98.7	88.5	115.6	85.3	87.0	88.0
Bureau of Reclamation	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
LAND USE (miles crossed, except as noted**)									
Miles within 1 mile of wilderness study areas	32.8	50.6	32.6	47.3	50.6	42.3	32.8	32.8	32.8
Approximate number of residences within 1 mile**	83	78	80	83	83	94	93	92	96
Miles parallel to H-frame 69kV transmission line	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Miles parallel to H-frame 138kV transmission line	30.0	5.9	5.9	50.8	39.9	5.9	14.2	14.2	14.2
Miles parallel to H-frame 230kV transmission line	0	0	0	0	0	25.0	0	0	0
Miles parallel to 345kV transmission line	96.5	73.0	73.0	80.0	96.5	33.5	96.5	96.5	96.5
Miles parallel to 500kV transmission line	0	0	0	0	0	27.5	0	0	0
Miles within designated or planning utility corridor	341.8	358.1	335.4	328.7	312.9	387.9	343.5	340.1	320.0
Miles outside designated or planning utility corridor	136.1	116.4	136.1	151.3	175.7	136.4	161.5	161.5	183.1
Miles within Military Operating Area/Restricted Area	130.0	182.0	130.0	128.4	182.0	130.0	130.0	130.0	130.0
Agricultural lands	16.8	16.8	16.8	16.8	16.8	22.0	16.8	16.8	16.8
Range allotments	491.9	493.0	485.8	492.4	502.6	507.3	473.2	472.1	470.4
Mining claims	38.0	65.2	39.5	48.3	61.0	32.5	36.8	36.6	35.9
Number of tanks and wells along centerline**	11	10	11	12	11	10	10	10	10
Number of corrals along centerline**	0	1	0	0	1	0	1	1	1
VISUAL RESOURCES (miles crossed, except as noted**)									
Number of scenic highways and roads crossings**	1	1	1	1	1	2	1	1	1
Route visible from residences within 1 mile	65.7	52.3	57.1	61.9	64.1	56.9	59.9	59.9	63.1
Scenic quality Class A landscapes	0.9	0.9	0.9	0.9	0.9	5.0	0.5	0.5	0.5
VRM Class II landscapes	7.3	17.8	5.6	10.0	19.5	7.5	8.1	8.1	8.1
CULTURAL ENVIRONMENT									
CULTURAL RESOURCES (miles crossed, except as noted**)									
Number of historic sites within 1 mile of route**	53	46	50	68	46	54	61	61	58
Number of ethnohistoric sites within 1 mile of route**	13	16	14	12	15	16	14	14	14
Number of prehistoric sites within 1 mile of route**	388	413	408	430	386	510	399	388	381
Number of other cultural sites within 1 mile of route**	9	8	7	12	11	6	9	10	9
Miles through predicted high cultural sensitivity zones	18.4	19.3	17.2	20.5	18.4	11	20.6	20.5	18.4
Oregon Trail crossings**	1	1	1	1	1	1	1	1	1
California Immigrant Trail crossings**	3	1	2	3	2	3	2	3	3
Pony Express Trail crossings**	1	2	1	1	1	1	1	1	2

* Environmentally Preferred Route

Note: Totals for the Utility and Agency preferred routes vary from Route G because several different alternative routes segments are used (refer to p. 2-54).

Table 2-4, Route Comparison Table - Midpoint to Dry Lake Routes (continued)

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Value	Route A* High	Route A* Mod	Route A* Low	Route B High	Route B Mod	Route B Low	Route C High	Route C Mod	Route C Low	Route D High	Route D Mod	Route D Low	Route E High	Route E Mod	Route E Low	Route F High	Route F Mod	Route F Low	Route G High	Route G Mod	Route G Low	Utility High	Utility Mod	Utility Low	Agency High	Agency Mod	Agency Low
VISUAL RESOURCES	13.5	72.7	427.0	14.5	62.6	439.2	14.5	66.8	425.8	13.5	68.5	431.4	13.5	71.7	438.7	19.5	71.0	433.7	14.7	65.4	424.9	14.9	67.5	419.5	14.9	70.7	417.8
BIOLOGICAL RESOURCES	15.0	36.5	200.3	26.2	24.2	204.2	20.4	25.6	181.7	13.5	48.4	214.6	17.8	34.8	221.2	17.8	27.2	177.7	24.8	41.0	191.7	25.6	45.0	206.4	22.6	42.5	206.9
CULTURAL RESOURCES	6.8	104.0	131.6	7.4	117.4	142.2	5.9	106.1	138.5	6.6	124.8	140.2	7.8	122.2	134.5	8.2	103.9	143.2	7.3	105.0	132.5	7.5	102.1	261.9	7.0	109.0	132.2
LAND USE RESOURCES	0	64.1	88.8	0	75.2	129.6	0	64.1	88.9	0	64.1	87.6	0	75.5	129.5	0	64.1	101.2	0	64.1	88.4	0	63.8	71.0	0	63.8	71.0
EARTH RESOURCES	0	46.7	454.3	0	50.6	453.5	0	45.0	449.9	0	46.9	452.4	0	54.6	455.3	0	45.4	465.4	0	40.9	456.4	0	23.3	473.7	0	25.5	471.2

COMMENTS

Route A
- least impacts to ferruginous hawks
- least miles of riparian habitat crossed
- most residences within one mile
- crosses most miles of sage grouse habitat

Agency Preferred Route
- reduces visual impacts to U.S. Highway 93
- crosses most miles of crucial pronghorn habitat
- crosses high mileage of sage grouse habitat

Utility Preferred Route
- crosses least steep terrain
- reduces visual impacts to U.S. Highway 93
- crosses most miles of sage grouse leks

Route B
- crosses least miles of riparian habitat
- crosses most miles of bald eagle nesting areas
- least mileage visible from residences
- most mileage in high erosion potential soils

Route C
- crosses least miles of sage grouse habitat
- crosses least miles of BLM-administered lands
- crosses least miles of VRM Class II landscapes

Route D
- crosses most miles of riparian habitat
- least mileage in high erosion potential soils
- crosses high mileage of sage grouse habitat

Route E
- crosses most BLM-administered lands
- crosses high mileage of sage grouse habitat
- most impacts to peregrine falcon

Route F
- visual impacts to Hagerman Fossil Beds National Monument
- crosses most agricultural land
- crosses most private lands
- most cultural sites within one mile

Route G
- reduces visual impacts to U.S. Highway 93
- crosses least miles of private land
- crosses high mileage of crucial pronghorn habitat

	Route A*	Route B	Route C	Route D	Route E	Route F	Route G	Utility	Agency
ESTIMATED COST									
Estimated cost (x millions)	248	251	245	248	254	253	244	242	243
ROUTE LENGTH									
Total Route Mileage	513.0	516.1	506.9	513.5	523.7	524.0	504.7	503.1	501.6
ENVIRONMENTALLY PREFERRED ROUTE									
Ranking	1	4	2	2	2	5	3	3	3

* Environmentally Preferred Route

Note: Totals for the Utility and Agency preferred routes vary from Route G because several different alternative routes segments are used (refer to p. 2-54).

TABLE 2-5

Route Comparison Table - Ely to Delta Routes

	Direct Route	Cutoff Route**	230kV Corridor Route***	Southern Route
Construction Access Levels (miles crossed)				
Agricultural lands	0	0	2.1	0
Existing access with spur roads	35.0	39.9	59.1	55.7
New access roads in flat (0-8%) terrain	38.5	50.2	49.1	73.3
New access roads in rolling (8-35%) terrain	44.8	46.4	34.9	60.8
New access roads in steep (35-65%) terrain	17.5	17.4	15.6	21.2
NATURAL ENVIRONMENT				
WILDLIFE (miles crossed)				
Desert tortoise habitat	0	0	0	0
Bald eagle nesting	7.0	8.4	17.8	0
Peregrine falcon	0	0	0	0
Ferruginous hawk nest	0	0	4.5	10.1
Sage grouse leks or winter range	7.9	6.8	7.1	11.8
Crucial Elk habitat	0	0	5.5	0
Bighorn sheep habitat and movement corridor	0	0	0	0
Crucial pronghorn habitat	56.5	70.1	71.5	85.7
Crictical Mule deer habitat	12.3	11.0	14.1	12.5
VEGETATION (miles crossed)				
Rare plants	0	0	0	3.0
Grasslands	27.3	33.2	36.0	27.0
Sage scrub	83.3	100.9	104.5	155.0
Woodland/mountain shrub/grasses	0.6	0.5	3.5	7.0
Riparian	1.6	1.2	0.9	0.1
EARTH RESOURCES (miles crossed, except as noted*)				
Miles of high water erosion hazard soils crossed	14.4	22.1	31.2	17.1
Miles of high wind erosion hazard soils crossed	8.6	12.6	19.2	40.1
Number of springs within 1/2 mile of route*	2	2	6	12
Number of perrenial streams crossed*	0	0	4	3
Miles of flood hazard areas crossed	0	0	0	0
Miles of landslide hazard areas crossed	0	0	0.6	0
Areas of high paleontological sensitivity	55.5	55.6	64.9	84.7

** Environmentally Preferred Route
*** Utility and Agency Preferred Routes

Table 2-5, Route Comparison Table - Ely to Delta Routes (continued)

	Direct Route	Cutoff Route*	230kV Corridor Route**	Southern Route
HUMAN ENVIRONMENT				
LAND JURISDICTION (miles crossed)				
Bureau of Land Management	125.7	143.4	131.0	197.4
Forest Service	0	0	9.0	0
State	7.2	10.5	9.0	12.0
Private	0	0	11.8	1.6
LAND USE (miles crossed)				
Miles within 1 mile of wilderness study areas	0	13.8	12.3	14.1
Number of residences within 1 mile	0	2	26	0
Miles parallel to H-frame 69kV transmission line	0	0	34.5	0
Miles parallel to H-frame 230kV transmission line	11.3	72.3	159.8	18.5
Miles parallel to 500kV transmission line	12.8	20.0	20.0	31.0
Miles within designated or planning utility corridor	26.7	78.0	163.0	213.5
Miles outside designated or planning utility corridor	102.9	78.1	0	0
Miles within military operating area/Restricted Area	104.2	123.0	79.0	102.5
Agricultural lands	0	0	2.1	0.1
Prime/Unique farmlands	0	0	1.2	0
Range allotments	135.1	153.9	151.9	211.0
Mining claims	7.8	6.9	28.7	1.9
Number of tanks and wells along route*	1	0	1	0
Number of corrals along route*	0	0	0	0
VISUAL RESOURCES (miles crossed, except as noted)*				
Number of scenic highway or road crossings*	0	0	0	1
Mileage of route visible from residences within 1 mile	3.3	5.1	23.9	4.8
Scenic quality Class A landscapes crossed	0	4.2	4.2	0
VRM Class II landscapes crossed	0	0	0	2.0
CULTURAL ENVIRONMENT				
CULTURAL RESOURCES (miles crossed, except as noted)*				
Number of historic sites within 1 mile of route*	4	5	12	8
Number of ethnohistoric sites within 1 mile of route*	8	8	8	10
Number of prehistoric sites within 1 mile of route*	21	26	80	66
Number of other cultural sites within 1 mile of route*	1	1	1	1
Miles through predicted high cultural sensitivity zones	0.8	0.8	8.0	6.0
Pony Express Trail crossings*	1	1	0	0

** Environmentally Preferred Route
*** Utility and Agency Preferred Routes

Table 2-5, Route Comparison Table - Ely to Delta Routes (continued)

	Direct Route			Cutoff Route**			230kV Corridor Route***			Southern Route		
SUMMARY OF ENVIRONMENTAL CONSEQUENCES												
Impact Value	High	Mod	Low	High	Mod	Low	High	Mod	Low	High	Mod	Low
VISUAL RESOURCES	0.6	6.4	128.1	1.2	13.7	139.0	7.3	31.6	121.8	4.1	22.5	183.1
BIOLOGICAL RESOURCES	4.7	5.1	82.2	5.8	7.7	94.1	0.4	12.4	117.3	10.3	17.7	120.8
CULTURAL RESOURCES	4.6	19.1	16.3	4.6	32.7	21.4	5.5	39.7	44.5	11.6	41.7	48.0
LAND USE RESOURCES	0.0	65.3	38.9	0.0	0.0	123.0	0.0	0.0	80.9	0.0	0.0	103.2
EARTH RESOURCES	0.0	8.4	125.9	0.0	7.8	144.0	0.0	6.9	152.7	0.0	2.4	200.2

COMMENTS

Direct Route
- shortest route
- avoids visual impacts to Great Basin National Park
- crosses Leland-Harris spring complex
'- crosses through R-6405 Restricted Area of UTTR
- crosses least aricultural lands
- crosses least miles of crucial pronghorn habitat

Cutoff Route**
- crosses least aricultural lands
- avoids visual impacts to Great Basin National Park
- crosses least mileage of sage grouse habitat

****Environmentally Preferred Route (and preferred by National Park Service)**

230kV Corridor Route***
- best utilizes the existing utility corridor
- crosses most miles of bald eagle nesting areas
- crosses high mileage of crucial pronghorn habitat
- most residences within 1 mile
- crosses most national forest lands and private land:

Southern Route
- longest route and most miles in steep terrain
- highest overall environmental impacts
- crosses most BLM-administered lands
- least miles in military operating areas of UTTR

*****Agency and Utility Preferred Route**

	Direct Route	Cutoff Route**	230kV Corridor Route***	Southern Route
ESTIMATED COST				
Estimated cost (x million)	66	72	77	100
ROUTE LENGTH				
Total Route Mileage	132.9	153.9	160.8	211.0
ENVIRONMENTALLY PREFERRED ROUTE				
Ranking	3	1	2	3

TABLE 2-6
Summary of Selectively Committed Mitigation

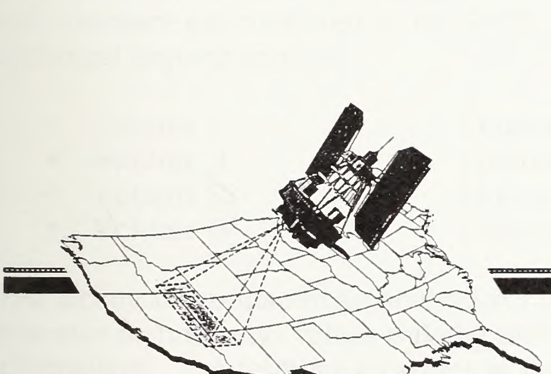
Midpoint to Dry Lake Routes

Alternative	Mitigation Measures* (miles)											
	1	2	3	4	5	6	7	8	9	10	11	12
*Route A***	140.5	202.5	204.0	165.4	102.7	158.3	0	17.4	334.0	92.1	89.6	2.2
Route B	142.2	201.2	212.1	181.3	113.8	179.9	0	11.9	335.4	109.5	93.6	5.3
Route C	138.2	195.1	199.3	158.5	102.7	155.8	0	12.7	328.7	97.2	87.7	1.9
Route D	140.6	232.8	223.0	179.1	102.7	162.4	0	13.5	364.0	94.8	90.4	0.7
Route E	142.2	221.3	226.8	199.1	113.8	183.0	0	13.1	358.3	109.7	92.9	4.3
Route F	141.7	193.1	198.0	161.4	91.1	160.4	27.4	18.8	347.5	106.3	86.1	1.6
Route G	135.5	201.7	195.8	162.2	102.7	159.6	0	12.7	313.7	97.0	84.9	2.3
Utility	131.2	204.9	196.2	164.2	102.7	160.4	0	12.7	319.2	99.0	83.6	1.4
Agency	135.2	199.3	193.3	159.9	102.7	161.3	0	12.7	312.5	97.0	86.5	2.3

Ely to Delta Routes

Alternative	Mitigation Measures* (miles)											
	1	2	3	4	5	6	7	8	9	10	11	12
Delta Direct	13.2	59.8	75.8	75.0	67.8	17.1	9.0	3.3	57.3	4.2	19.6	2.9
*Cutoff ***	23.5	83.4	86.2	83.5	15.5	43.3	16.6	3.9	85.1	15.4	18.0	2.9
*230kV Corridor****	48.9	87.0	78.0	64.8	11.8	82.4	16.6	6.9	117.4	19.3	30.6	0
Southern	37.0	124.9	118.6	99.6	7.3	62.2	27.8	5.5	127.2	31.0	43.6	4.9

* Numbers indicate Selectively Committed Mitigation Measures described in Table 4-2
** Environmentally Preferred Route
*** Agency and Utility Preferred Route



CHAPTER 3
AFFECTED ENVIRONMENT

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AFFECTED ENVIRONMENT

INTRODUCTION

This chapter provides a description of the environment potentially affected by the construction, operation, and maintenance of the proposed Southwest Intertie Project (SWIP). The project area is described in terms of three environments:

Natural Environment

- air quality and meteorology
- earth resources (soils, geology, paleontology, minerals, surface hydrology)
- biological resources (vegetation, wildlife, riparian, wetlands, and threatened, endangered, and other special-status species)

Human Environment

- land use resources (land jurisdiction, existing and planned land uses, parks, recreation, and preservation areas, transportation and access, grazing and mining claims and extractive uses)
- visual resources (viewpoints, natural scenery)
- socioeconomics

Cultural Environment

- cultural resources (prehistory, enthnohistory, history, archaeology)

The inventory was conducted to provide a basis to evaluate the impacts of the alternative routes. Methods of inventory varied among the various resources. Therefore, the inventory areas and methods are summarized in each resource section. Detailed inventory results for each resource are contained in the SWIP Technical Reports (Dames & Moore, 1991). These Technical Reports include:

- Volume I — Objectives, Procedures, and Results
- Volume II — Natural Environment
- Volume III — Human Environment
- Volume IV — Cultural Environment

The technical reports are accompanied by data tables. These tables locate and specify resource features and values mile by mile along the assumed centerlines of all the routing alternatives. The resource locations in these tables correspond to the locations illustrated on the maps in the accompanying Map Volume. The technical reports and data tables are available for public review at the agency offices listed in Appendix H.

During the regional environmental study, alternative routes were first identified as broad corridors of varying widths, referred to as preliminary corridors (refer to Chapter 2 for a discussion of the regional studies). Reference, or assumed, centerlines (routes) within each preliminary corridor were identified on maps and in field reviews by representatives from Idaho Power Company (IPCo), Los Angeles Department of Water and Power (LADWP), Dames & Moore, Bureau of Land Management (BLM), National Park Service (NPS), and the Forest Service (FS). The areas covered by each resource investigation along each of the alternative routes are called study corridors. The study corridors varied in width from one to three miles on either side of the assumed centerlines. The study corridors identified during the SWIP studies should not be confused with agency planning or designated utility corridors, used by the BLM, FS, and other federal land management agencies to consolidate utility rights-of-way. In some cases, however, the agency utility corridors and the study corridors do correspond.

The resource discussions that follow are based on the environmental studies described in Chapters 2 and 5. The inventory results presented in this chapter are for each of the final alternatives:

- **Midpoint to Dry Lake** - Route A, Route B, Route C, Route D, Route E, Route F, and Route G

- **Ely to Delta** - Direct Route, Cutoff Route, 230kV Corridor Route, and Southern Route

Comparative data for each of these alternative routes, as well as the Utility and the Agency Preferred Routes are listed in Tables 2-4 and 2-5 in Chapter 2.

The environmental data, impact assessment, mitigation planning, and comparative data for substations and microwave facilities are located in Appendices E and F.

NATURAL ENVIRONMENT

Air Quality and Meteorology

The climate in southern Idaho, eastern Nevada, and western Utah is influenced largely by location, regional weather systems, and topographic orientation. The climate throughout much of this area is characterized by hot, dry summers and cold, dry winters. Surface winds are channeled through valleys between generally north-south trending mountain ranges. Winds flow predominately in northeasterly or southwesterly directions. Annual precipitation depends largely on elevation. Precipitation occurs primarily in the form of snow at higher elevations during the winter months. The snows maintain high water tables and provide groundwater recharge. Some additional precipitation occurs from thunderstorms produced by daytime heating of air masses in valleys.

Temperatures average in the mid 70s during July and in the mid 20s during January on the Snake River Plateau of southern Idaho. In Nevada, average temperatures during July range

between the high 60s at higher elevations (e.g., Ely area) to the low 90s at lower elevations (e.g., Las Vegas area). During January, average temperatures in Nevada range between the high 20s at higher elevations (e.g., Ely area) to the mid 40s at lower elevations (e.g., Las Vegas area). Temperatures in southwestern Utah average in the high 70s during July and the high 20s during January.

The existing air quality conditions along the alternative routes and ancillary facilities of the SWIP are briefly described below. Because of the remoteness of much of the proposed project study area, current data are quite sparse, however some data were available from air and weather monitoring stations in the general vicinity. Characterization of the existing air quality and meteorology is based on data gathered between 1987 and 1989. Existing air quality and meteorology monitoring data compiled are listed in technical Air Quality and Meteorology technical report (refer to Appendix H for the locations where technical reports can be reviewed).

The Jarbidge Wilderness Area, located 30 miles west of the nearest routing alternatives in northern Nevada, was the only Prevention of Serious Deterioration (PSD) Class I area identified within the study corridors. Class I is identified as an area where the cleanest and most stringent degree of protection from future air quality degradation applies. Class I areas include national and international parks, national wilderness areas (exceeding 5,000 acres), and national memorial parks (exceeding 5,000 acres). All other wilderness areas, Wilderness Study Areas (WSAs) and national parks identified in or adjacent to study corridors are classified as PSD Class II. Class II allows a moderate degree of degradation, and Class III a lesser degree of protection from future air quality degradation. No degradation, however, no matter what class, can exceed the National Ambient Air Quality Standards (NAAQS).

Three areas within the study corridors currently do not meet the NAAQS and are classified as nonattainment areas. Two areas in Nevada include Las Vegas in Clark County (which is a nonattainment area for carbon monoxide and total suspended particulates) and the Lower Steptoe Valley (a nonattainment area for sulfur dioxide) near McGill. The third nonattainment area is located at the Intermountain Generating Station north of Delta, Utah.

Standards and regulations for primary and secondary federal air quality allowances, monitoring, and permitting for the pollutants of concern for the proposed project are established under the Clean Air Act of 1970, the 1977 Amendments, and the 1990 Amendments. Air quality standards and regulations for the states of Idaho, Nevada, and Utah follow or are more stringent than federal standards and regulations. Air pollutants expected during the project construction include suspended particulates, carbon dioxide, sulfur oxides, and nitrogen oxides.

Earth and Water Resources

Introduction

The purpose of the earth and water resource study is to identify geological, paleontological, soil, and water features that may be affected by the construction, operation, and maintenance of the a 500kV transmission line.

The National Environmental Protection Act of 1969 (NEPA) is the primary legislation that requires addressing potential impacts to earth and water resources and is the basis for this report. Some federal legislation that addresses protection of the land and water resources includes the Federal Land Policy and Management Act of 1976 (FLPMA), the Antiquities Act of 1906 with amendments, and the Clean Water Act of 1972 (CWA) with amendments.

The issues of concern regarding the location of the proposed transmission line include the loss of soil and soil productivity from increased erosion or soil compaction, conflicts with potential mineral development, the destruction of significant fossils, possible scarring and increased erosion in landslide areas, and the degradation of water quality from soil erosion and sedimentation. Also, areas prone to flooding may be susceptible to construction, maintenance, and tower stability problems.

Methods

Information for the inventory was obtained primarily from publications and discussions with agency specialists of the BLM, FS, Soil Conservation Service (SCS), Geological Survey (USGS), Bureau of Mines, Federal Emergency Management Agency (FEMA), Idaho Bureau of Mines and Geology, Idaho Department of Water Resources (IDWR), Idaho Museum of Natural History, Utah Division of State History, Utah Geological and Mineral Survey, Brigham Young University, University of Nevada (Reno), Nevada Bureau of Mines and Geology, and the University of Utah.

Specific resource features that were identified on maps include

- known potential geologic formations
- areas with potential mineral resources
- known fossil localities
- landslide areas
- soil units
- prime farmland
- intermittent and perennial streams and lakes
- springs
- shallow ground water
- known faults
- flood-prone areas

Recent satellite imagery was also used to inventory data and verify locations of sensitive features. Data were identified within 0.5 mile of the assumed centerline for each routing alternative (study corridor), and were delineated on project maps at 1:100,000 scale. A GIS was used to map the inventory, to assist impact assessment, and document the results of the analysis.

Results

Resource features that have a high sensitivity are:

- soils with either a high wind erosion or high water erosion potential
- areas of high paleontological sensitivity
- areas of active mining
- known potential landslide hazard areas, perennial streams and lakes
- springs
- wetland areas

Only the high sensitive data categories that are issues of concern are described below. Also refer to the technical reports for the location and quantification of the less sensitive features inventoried. The technical report includes narrative and tables that describe the inventory mile by mile along the assumed centerline of the routing alternatives (refer to Appendix H for the locations where technical reports can be reviewed).

Disturbance to the land surface within the alternative study corridors results mainly from agriculture, livestock grazing, and roads. Agricultural activities have disturbed the native condition of the soils to a great extent in Idaho, primarily in the Snake River Valley. Numerous unpaved and two-track roads are present. The soils in the "true" desert in Lincoln, Nye, and Clark counties are sensitive to disturbance because the soils erode easily when the surface is disturbed. There is very little perennial surface water in the study area, but the water quality of perennial lakes and streams is generally considered to be good. A small part of the east side of Goose Lake to the west of Eden, Idaho (Link 30), is the only perennial lake crossed by the routes.

Areas described in the following discussion considered as being **large** are usually crossed by more than 0.5 mile of alternative routes while those described as **small** are typically less than 0.5 mile along the assumed centerline. Numbers of occurrences or number of miles along the assumed centerline are quantified in parentheses. Also refer to the maps in the accompanying Map Volume.

Alternative Routes - Midpoint to Dry Lake

Route A

In summary, there would be a total of approximately 23.8 miles of high sensitivity paleontological area crossed along the entire route. A total of approximately 39.0 miles of soils with a high potential of water erosion and approximately 63.7 miles of soils with a high potential of wind erosion occur along the route. There are 26 perennial streams identified along the route centerline and 42 springs within 0.5 mile of the assumed centerline. Areas with a flood potential are delineated along 6.2 miles of the route.

Between the Midpoint Substation and Jackpot, soils with a high potential of water erosion occur in large areas north and east of Jackpot and in small areas primarily along the foothills north of the Sawtooth National Forest near Rock Creek. Soils with a high potential of wind erosion occur in small areas east of the Salmon Falls Creek Reservoir. There are 18 mapped crossings of streams and canals:

- Milner-Gooding Canal near Midpoint (2)
- the Main Canal (4) northeast of Hansen
- the Twin Falls Main Canal (6) south of the Snake River
- Rock Creek (1), McMullen Creek (1), and Cottonwood Creek (1) along the foothills north of the Sawtooth National Forest
- Green Creek (1) and Deep Creek (1) northeast and east of Rogerson
- Salmon Falls Creek (1) southeast of Jackpot

Route A crosses a small portion of the east side of Goose Lake west of Eden, Idaho. There are no high sensitivity paleontological resources or flood potential areas along this segment of the route.

From Jackpot to Windermere Hills (Links 110, 130, and 160), soils with a high potential of water erosion occur in large areas between Contact and Willow Creek. Salmon Falls Creek east of Contact (Link 102) is the only perennial stream crossed and areas with potential for flooding occur near Salmon Falls Creek (2.4 miles) east of Contact and near Thousand Springs Creek (0.3 mile). Potentially high sensitivity paleontological resources occur in Tertiary sedimentary rocks (Ts1, Ts3) in large areas throughout this route, but in the area primarily south of Contact. Soils with a high potential of wind erosion were not identified along this segment of the route.

From Windermere Hills to north of Interstate 80, soils with a high potential of water erosion occur in a large area west of Toano Draw north of Interstate 80 (Links 152, 200, and 211). High sensitivity paleontological resources may occur in sedimentary rocks (Ts1, Ts3) in large areas northeast of the Windermere Hills and in small areas northeast of the Pequop Mountains. Areas of soils with high wind erosion potential, perennial streams, or areas prone to flooding are not known to occur in this segment.

From Interstate 80 to north of Dolly Varden, soils with a high potential of wind erosion occur in large areas in Goshute Valley from south of Interstate 80 to Dolly Varden (Links 211, 212,

and 230). Soils with a high potential of wind erosion, perennial streams, areas with the potential for flooding, or areas with the potential for high sensitivity paleontological resources do not occur in this area.

From north of Dolly Varden to the North Steptoe substation site, soils with a high potential of wind erosion occur in large areas in Goshute Valley from Dolly Varden to south of Mizpah (Links 230 and 250) and northwest of the North Steptoe substation site. Areas with a potential for flooding occur in large areas of Goshute Valley from Dolly Varden to Nelson Creek (Link 230) and west of the Currie Hills (Link 250). Several springs within 0.5 mile of the assumed centerline are located mainly west and southwest of Goshute Lake. Tertiary sedimentary rocks (Ts3) potentially containing high sensitivity paleontological resources occur in small areas in the Currie Hills. There were no perennial streams or soils with a high potential of water erosion identified along this segment of the route.

From the North Steptoe substation site to the Robinson Summit substation site, soils with a high potential of water erosion occur in large areas near Warm Springs to the east of the Egan Range, and north of Robinson Summit. Soils with a high potential of wind erosion are present in large areas of the Steptoe Valley from Lages Station to Cherry Creek (Links 259, 260, 261, and 270) and from north of Warm Springs to northwest of Steptoe (Links 291, 293, and 310), and in Butte Valley from the west side of the Egan Range to Robinson Summit (Links 293 and 310). Tertiary sedimentary rocks (Tys) with a high paleontological sensitivity are present north of Robinson Summit. No perennial streams or areas prone to flooding were identified in this area.

From the Robinson Summit substation site to the Dry Lake substation site, soils with a high potential of water erosion occur in large areas along the White River Valley west and southwest of the Wayne Kirch Wildlife Management Area and in small areas along the foothills on the east side of Jakes Valley. Soils with a high potential of wind erosion occur in small areas of Jakes Valley from Robinson Summit to Jakes Wash (Links 340, 362 and 363) and in large areas south of Ellison Creek west of Preston (Link 670), along Pahranagat Wash from Maynard Lake to Coyote Spring Valley (Links 690, 700 and 720), and in Dry Lake Valley (Links 700 and 720). Areas with a potential for flooding occur along Ellison Creek (0.7 mile) west of Preston, along the White River west of Preston (0.1 mile) and southwest of the Wayne Kirch Wildlife Management Area (0.3 mile), and in numerous small areas along Pahranagat Wash, Coyote Spring Valley, and in Hidden Valley west of Dry Lake (Links 690, 700, and 720). High sensitivity paleontological resources are present in younger Tertiary sedimentary rocks (Tys) in a few small areas south of Robinson Summit and near Ellison Creek west of Preston (approximately 1.4 miles along the centerline route). No perennial streams were identified along this segment of the route.

Route B

Route B would cross approximately 38.6 miles of high sensitivity paleontological resources. Soils with a high potential of water erosion are present along 53.1 miles, and soils with a high potential of wind erosion are present along 63.8 miles. There are 27 perennial streams

that would be crossed along the assumed centerline, and 20 springs are present within 0.5 mile of the assumed centerline. Areas prone to flooding occur along 1.2 miles of Route B.

Route B is the same as Route A from Midpoint Substation to Jackpot. From Jackpot to north of Interstate 80, soils with a high potential of water erosion occur in large areas including south of Jackpot, along Trout Creek between Texas Spring Canyon and Burnt Creek in the Granite Range (Links 92 and 140) and west of Toano Draw north of Interstate 80 (Links 144, 200, and 221). The perennial streams that are crossed (and the number of times crossed) by this subroute are Salmon Falls Creek (1) south of Jackpot (Links 72 and 91), Trout Creek (2) in the Granite Range, and Thousand Springs Creek (1)(Link 140) southeast of Knoll Mountain. One spring occurs along the assumed centerline near Trout Creek. High sensitivity paleontological resources occur in Tertiary sedimentary rocks (Ts1, Ts3) in large areas along Trout Creek to Five Mile Draw and in small areas west of Toano Draw. No areas were identified as being prone to flooding or having soils with a high potential of wind erosion.

From north of Interstate 80 to Lages Station, soils with a high potential of water erosion occur in large areas in the Toano Range northwest of Wendover, in the Boone Spring Hills, and east of Boone Canyon northeast of Lages Station. Large areas of soils with a high potential of wind erosion occur in Antelope Valley from Boone Spring in the Antelope Range to Lages Station (Link 226). A small area with the potential for flooding is present along the Northern Pacific Railroad line near Oasis. High sensitivity paleontological resources occur in Tertiary sedimentary rocks (Ts1) east of Boone Canyon in the Antelope Range. There were no perennial streams identified along the corridor centerline.

From Lages Station to Cherry Creek Station segment, there are large areas of soils with a high potential of wind erosion. Soils with a high water erosion potential, areas with high sensitivity paleontological resources, perennial streams, or areas prone to flooding were not identified.

From Cherry Creek Station to the Robinson Summit substation site, soils with a high potential of water erosion occur in large areas near Cocomongo Mountain to the southwest of Cherry Creek Station (Link 280), and along White Sage Wash to the north of Robinson Summit (Link 280). Soils with a high potential of wind erosion are present in large areas east of Cocomongo Mountain, in Butte Valley south of the Cherry Creek Range, to the north and west of White Sage Wash, and to the north of Robinson Summit. Telegraph Creek (Link 280) in the Egan Range is the only perennial stream that would be crossed in this segment of the route. High sensitivity paleontological resources occur in younger Tertiary sedimentary rocks (Tys) north of Robinson Summit.

Route B is the same as Route A from Robinson Summit substation site to the Dry Lake substation site, northeast of Las Vegas.

Route C

In summary, 35.3 miles of high sensitivity paleontological resources would be crossed along the assumed centerline of Route C. Approximately 44.4 miles of soils with a high potential of water erosion and 63.7 miles of soils with a high potential of wind erosion are crossed. There are 23 perennial streams and 2.1 miles of land prone to flooding. There are 20 springs identified within 0.5 mile of the assumed centerline of this route.

Route C is the same as Route B from Midpoint Substation to Interstate 80 and the same as Route A from Interstate 80 to Dolly Varden.

In the route segments from north of Dolly Varden to the North Steptoe substation site, there are soils with a high potential of water erosion present near the Currie Hills. Soils with a high wind erosion potential occur in large areas in Goshute Valley from Dolly Varden to east of Mizpah (Links 230 and 250) and in the Steptoe Valley from south of the Currie Hills to Lages Station (Links 250 and 259). Areas prone to flooding occur in large areas of Goshute Valley from Dolly Varden to Nelson Creek (4.2 miles) and south of the Currie Hills (0.6 mile). Tertiary sedimentary rocks (Ts3) contain potentially high sensitivity paleontological resources in small areas of the Currie Hills. No perennial streams were identified.

Route C is the same as Route A from the North Steptoe substation site to Dry Lake substation site.

Route D

High sensitivity paleontological resources are present along approximately 21.9 miles along Route D. Approximately 35.2 miles of soils with a high potential of water erosion and 57.0 miles of soils with a high potential of wind erosion are crossed by this route. There are 22 perennial streams crossed and 45 springs identified within 0.5 mile of the assumed centerline. Approximately 3.1 miles of land prone to flooding are crossed by this alternative.

Route D is the same as Route A from Midpoint Substation to the Windermere Hills. From Windermere Hills to Dolly Varden, soils with a high potential of water erosion occur in large areas on the east side of the corridor near Wells, along the west side of the Wood Hills, and in the Pequop Mountains near Hogan. Soils with a high potential of wind erosion occur in large areas east of Ventosa in the Independence Valley (Link 190) and north of Dolly Varden in the Steptoe Valley (Links 190 and 230). High sensitivity paleontological resources occur in Tertiary sedimentary rocks (Ts2) in a small area northeast of Bishop Creek Reservoir. Perennial streams and areas with the potential for flooding were not identified. The segment from Dolly Varden to the Dry Lake substation site is the same as Route A.

Route E

In summary, there would be approximately 25.5 miles of high sensitivity paleontological resources that are crossed along this route. Approximately 48.6 miles of soils with a high potential of water erosion and 69.2 miles of soils with a high potential of wind erosion are crossed. There are 22 perennial streams crossed and 17 springs identified within 0.5 mile of the assumed centerline. Approximately 4.1 miles of land prone to flooding are also crossed by this route.

Route E is the same as Route A in the segment from Midpoint Substation to Interstate 80 and the same segment as Route B from Interstate 80 to the North Steptoe substation site (refer to discussion above). Route E is the same segment as Route A from the North Steptoe substation site to the Dry Lake substation site.

Route F

Approximately 37.4 miles of high sensitivity paleontological resources and approximately 1.8 miles of areas with known potential landslide hazard would be crossed by the centerline corridor of Route F. Approximately 39.6 miles of soils with a high potential of water erosion and 62.9 miles of soils with a high potential of wind erosion are crossed. There are eight perennial streams along the centerline and 17 springs identified within 0.5 mile of the centerline. Approximately 1.8 miles of land with the potential for flooding are also crossed by the centerline of the corridor.

From Midpoint to Jackpot, soils with a high potential of water erosion occur in large areas along the Snake River near Hagerman (Links 61, 64, and 70) and north of Jackpot, and in small areas west of the Snake River and near Salmon Falls Creek west and south of Hagerman (Link 64). Soils with a high potential of wind erosion are present in large areas between the Midpoint Substation and Hagerman, north of Jackpot, and in small areas east of Salmon Falls Creek Reservoir. The route crosses the following perennial streams one time: Clover Creek Canal (Link 61) southeast of Gooding and the Snake River (Link 61) near Hagerman. The route crosses the Salmon Falls Creek twice northwest of Castleford (Link 64) and again southwest of Jackpot. Areas with the potential for flooding occur along the Snake River (0.1 mile) and along Salmon Falls Creek (0.1 mile) southeast of Jackpot. High sensitivity paleontological resources occur in Quaternary and Tertiary sedimentary rocks (Qbs, Qtg) along and near the Snake River west of Hagerman (Link 61). This route would pass near the Hagerman Fossil Bed National Monument which is known for its paleontological resources such as the Hagerman Horse. Known potential landslide areas occur along the Snake River and Salmon Falls Creek near Hagerman. Route F is the same as Route C in the segment from Jackpot to Dry Lake substation site.

Route G

In summary, 30.6 miles of high sensitivity paleontological areas would be crossed along the entire route. Approximately 34.7 miles of soils with a high potential of water erosion and approximately 51.6 miles of soils with a high potential of wind erosion occur along the centerline of the corridor. There are 27 perennial streams identified along the route centerline and 45 springs within 0.5 mile of the assumed centerline. Areas with a potential flood hazard occur along 3.1 miles along this route.

Route G is the same as Route A in the segment from Midpoint Substation to Jackpot. From Jackpot to Interstate 80, soils with a high potential of water erosion occur in large areas between Contact and Wilkins, and east of the Pequop Mountains. Two perennial streams, Salmon Falls Creek and Thousand Springs Creek, are crossed. Areas with potential for flooding occur near Salmon Falls Creek (2.4 miles) east of Contact and near Thousand Springs Creek (0.3 mile). Numerous springs occur mainly between Contact and Willow Creek (Link 130), and near Thousand Springs Creek (Links 150 and 151). High sensitivity paleontological resources occur in Tertiary sedimentary rocks (Ts1, Ts3) in large areas between Contact and Willow Creek and in small areas west of Toano Draw.

Route G is the same as Route A in the segment from Interstate 80 to North Steptoe substation site. From the North Steptoe substation site to the Robinson Summit substation site, soils with a high potential of water erosion occur in large areas near the Cocomongo Mountain southwest of Cherry Creek Station (Links 270 and 180), and along White Sage Wash north of Robinson Summit (Link 280). Soils with a high potential of wind erosion are present in large areas in the Steptoe Valley and in Butte Valley south of the Cherry Creek Range, north and west of White Sage Wash, and north of Robinson Summit. Telegraph Creek (Link 280) in the Egan Range is the only perennial stream crossed by the subroute. There are 28 springs delineated within 0.5 mile of the centerline of Link 241 in the Steptoe Valley. High sensitivity paleontological resources occur in younger Tertiary sedimentary rocks (Tys) north of Robinson Summit. Flood hazards do not occur along this segment.

Route G is the same as Route A in the segment from the Robinson Summit substation site to the Dry Lake substation site.

Alternative Routes - Ely to Delta

Cutoff Route

In summary, 55.6 miles of high sensitivity paleontological resources would be crossed along the entire route. Soils with a high potential of water erosion are crossed for approximately 22.1 miles, and soils with a high potential of wind erosion are crossed for approximately 12.6 miles. Perennial streams and areas with the potential for flooding were not identified along this route. There are two springs within 0.5 mile of the assumed centerline of this route.

From the North Steptoe substation site to south of the Little Hills, soils with a high potential of water erosion occur in large areas in the Schell Creek Range, near Tippetts Pass (Link 266) south of Stonehouse, and near the Red Hills (Link 266). Soils with a high potential of wind erosion are present in small areas of Steptoe Valley. High sensitivity paleontological resources occur in Tertiary sedimentary rocks (Tys) in the Antelope Range east of Stonehouse and in Upper Cambrian rocks (Cu) in the Schell Creek Range.

In the segment from south of the Little Hills to the Buckskin Hills (Links 267 and 268) soils with a high potential of water erosion are present in a small area near Government Peak and in a large area in the Conger Range to the north of the Buckskin Hills (Link 470). High sensitivity paleontological resources occur in Quaternary colluvium and alluvium on the east and west sides of Snake Valley and east of the Buckskin Hills.

In the segment from the Buckskin Hills to the Intermountain Generating Station there are large areas of soils with a high potential of water erosion in Payson Canyon of the Confusion Range (Link 462), in Marjum Canyon of the House Range (Link 462), and in Swasey Wash of Whirlwind Valley (Link 470). Soils with a high potential of wind erosion are present in large areas between Coyote Knolls and Soap Hollow east of the House Range (Link 470), north and west of the Smelter Hills (Link 571), northeast of Sugarville near the Intermountain Generating Station (Links 581 and 582), and in small areas south of the Little Drum Mountains (Link 470 and 540) and north of the Topaz Lake Wildlife Management Area. High sensitivity paleontological resources are present in Quaternary alluvium and colluvium in large areas east of the Buckskin Hills in Tule Valley, between the House Range and Smelter Hills, and north of Sugarville (Links 581 and 582).

Direct Route

Along the entire route, approximately 55.5 miles of high sensitivity paleontological resources would be crossed. Approximately 14.4 miles of soils with a high potential of water erosion and 8.6 miles of soils with a high potential of wind erosion are present along the route. Two springs were identified within 0.5 mile of the assumed centerline.

The Direct Route is the same as the Cutoff Route from the North Steptoe substation site to south of the Little Hills. From south of the Little Hills to Intermountain Generating Station, soils with a high potential of water erosion occur in large areas north of Tin Springs Mountain (Link 620), at the north end of the Confusion Range, at the south end of the Middle Range (Link 630), and at the north ends of the House Range (Link 630) and the Little Drum Mountains (Links 630 and 650). Soils with a high potential of wind erosion occur in large areas north of the Smelter Hills and northeast of Sugarville near the Intermountain Generating Station. High sensitivity paleontological resources are present in Quaternary colluvium and alluvium in large areas of the Snake Valley, Tule Valley, east and west of the Drum Mountains, and north of Sugarville, and in Cambrian rocks (Marjum Formation) at the north end of the House Range.

230kV Corridor Route

Approximately, 64.9 miles of high sensitivity paleontological resources would be crossed by the centerline along the entire route. Soils with a high potential of water erosion occur for approximately 31.2 miles and soils with a high potential of wind erosion occur for approximately 19.2 miles along the centerline of the route. Four perennial streams are crossed and six springs occur within 0.5 mile of centerline.

In the segment from Robinson Summit to the Buckskin Hills, soils with a high potential of water erosion occur in small areas in the Egan Range east of Robinson Summit and in large areas along the foothills of the Duck Creek Range east of Ely (Link 370), from the west side of the Schell Creek Range through Cooper Canyon, (Link 380) in the Snake Range near Osceola (Link 460), and in the Buckskin Hills (Link 461). Soils with a high potential of wind erosion occur in small areas east of Robinson Summit, and in large areas of the Steptoe Valley from Hercules Gap to the foothills of the Schell Creek Range north and east of Ely, and in Spring Valley east of Osceola. High sensitivity paleontological resources are present in Quaternary alluvium and colluvium in large areas of the Snake Valley and in younger Tertiary sedimentary rocks (Tys) near Weaver Creek east of Osceola in the Snake Range. Perennial streams (and the number of crossings) occur at Steptoe Creek (1)(Link 380) east of Comins Lake, and at Weaver Creek (2)(Link 460) and Silver Creek (1)(Link 460) east of Osceola in the Snake Range. Six springs were identified within 0.5 mile of the centerline. The 230kV Corridor Route is the same as the Cutoff Route in the segment from the Buckskin Hills to the Intermountain Generating Station.

Areas of known potential landslide hazard occur along the 230kV Corridor Route for approximately 0.6 mile in Cooper Canyon to the southeast of Ely. Areas of active mining occur along the 230kV Corridor Route for approximately 1.0 mile on the east side of Spring Valley west of Osceola.

Southern Route

Along the entire route, approximately 84.7 miles of high sensitivity paleontological resources would be crossed. Approximately 17.1 miles of soils with a high potential of water erosion and 40.1 miles of soils with a high potential of wind erosion are present along the route. Twelve springs were identified within 0.5 mile of the assumed centerline. Three perennial streams would be crossed by this route and several areas with the potential for flooding were identified along this route.

From the Robinson Summit substation site to the Buckskin Hills, soils with a high potential of water erosion occur in small areas in the Egan Range east of Robinson Summit (Link 362) and in large areas, in Antelope Valley Wash (Link 451), and in the Tule Valley south of the Barns Hills (Link 451). Soils with a high potential of wind erosion occur in small areas east of Robinson Summit, and in large areas of the Steptoe Valley, along the foothills of the Egan Range at the western edge of the Steptoe Valley (Link 364), and in Swasey Wash southwest of Delta (Link 490). High sensitivity paleontological resources are present in Quaternary alluvium and colluvium in large areas of the Antelope Valley and Ferguson Desert.

Perennial streams occur near Martin Spring in the Egan Range where the route passes through Water Canyon and down Williams Creek to cross the mountains. Twelve springs occur in Water Canyon within 0.5 mile of the assumed centerline.

Biological Resources

Introduction

Federal environmental legislation and regulations applicable to biological resources in the project area include the Endangered Species Act of 1973 as amended, the Sikes Act, Title II as amended, FLPMA, the Migratory Bird Treaty Act of 1986, the Bald Eagle Act of 1940 (amended in 1962 to include the golden eagle), Section 404 of the Clean Water Act (CWA) (and amendments), Executive Orders 11990 (protection of wetlands) and 11988 (floodplain management), and NEPA. NEPA requires federal agencies to prepare environmental impact statements (EIS) on all major federal actions in accordance with CEQ implementing regulations (1978). Additional authority requiring the addressing of biological resources is listed in the technical report.

Biological resource data for the states of Idaho, Nevada, and Utah were obtained from a secondary (existing) data source for the SWIP regional study conducted by Dames & Moore in 1988 (also refer to Chapter 2). The regional inventory focused on the distribution of highly sensitive species of wildlife and plants and similarly sensitive habitat types. Locations of federally listed species and sensitive habitats were used to select a number of preliminary corridors to be studied further.

Methods

A biological inventory was then conducted for the SWIP alternative routes using data from scientific literature, existing Dames & Moore files, satellite imagery at 1:100,000 scale, SPOT black and white satellite imagery at 1:24,000 scale, and agency contacts. Data was collected within the study corridors one mile on either side of the assumed centerlines for each routing alternative. Agency personnel were asked to provide information on potential or known occurrences of sensitive species of wildlife and plants and on habitats of special concern within the study corridors. The following agencies were contacted for information: BLM, Forest Service, Fish and Wildlife Service (FWS), Utah Division of Wildlife Resources (UDWR), Nevada Department of Wildlife (NDOW), Idaho Department of Fish and Game (IDFG), and Idaho, Nevada, and Utah Natural Heritage Programs.

Data were collected and digitized into a GIS at a 1:100,000 scale for:

- vegetation types
- common and characteristic plant species found in each vegetation type
- vertebrate species likely to be found in habitats in the project area

- species listed as federally threatened, endangered or as candidates under review for listing
- species classified as rare, sensitive or otherwise protected by state agencies
- areas of special biological value or interest, including riparian and wetland habitats

The technical reports contains detailed information on the vegetation and wildlife resources inventoried. The results of the biological resources inventory are summarized below.

Results

Vegetative Communities

Eleven vegetative communities have been identified within the SWIP biological study area. Satellite imagery facilitated the identification and distribution of vegetation (refer to Map Volume). The imagery was "classified" using a computer to distinguish various spectral qualities, or light reflectivity from the ground surface digitally recorded by a satellite. Since the spectral qualities of some communities were similar on the satellite images, the eleven communities were mapped as seven vegetation types.

Shadscale, greasewood, samphire-iodine bush, and Great Basin sagebrush are all included under sage scrub. Mojave desert scrub and grassland communities are both uniquely identified. Wetland and riparian areas are listed under riparian. Piñon-juniper and alpine tundra are represented by woodland/mountain shrub/grasses. Limber/bristlecone pine and quaking aspen are represented by the mountain conifer/broadleaf category.

Agriculture - This is most prevalent in the Snake River plain in southern Idaho where native vegetation has been cleared for agricultural purposes (e.g., Links 10, 20, 40, 41, 61, 62, and 63). Also refer to the Land Use section in this chapter and the Landcover maps in the accompanying Map Volume for locations.

Grassland - Grassland communities occur throughout the alternative corridors, largely ecotonal with other plant communities, such as sage scrub (Links 71, 91, 92, 100, 110, 130, 160, 141, 142, 144, 152, 161, 200, 211, 221, 243, 259, 260, 270, 362-63, 420, 430, 450, etc.) and piñon-juniper (Links 263, 264, 280, 350), but are often present as discrete grassland units. Many native species have been replaced historically during land management practices by exotics, such as cheatgrass brome (Bromus tectorum), crested wheatgrass (Agropyron cristatum), filaree (Erodium cicutarium), tumble mustard (Sisymbrium altissimum), and thistle (Salsola iberica). Native species include gramas (Bouteloua spp.), bluegrasses (Poa spp.), needlegrasses (Stipa spp.), galleta (Hilaria jamesii), sand dropseed (Sporobolus cryptandrus), Indian ricegrass (Oryzopsis hymenoides), and squirreltail (Sitanion hystrix).

Sage Scrub - The four distinct communities categorized under sage scrub are described below. The most common is Great Basin sagebrush, the other three have more specialized

habitat requirements. Very few links cross sage scrub exclusively (e.g., Links 70, 300, 310, and 320), most being ecotonal with grasslands (links listed above).

- Shadscale Community - Shadscale (Atriplex confertifolia) occurs in low elevation, often saline basins typified by low precipitation, heavy soils, and a water table too deep to support stands of greasewood. This shrub-dominated community normally has cover values less than 12 to 15 percent, and plants that are often less than one meter in height.

- Greasewood Community - Greasewood (Sarcobatus vermiculatus) occurs in saline soils along the edges of playas where the water table is high. Salts from the soils are drawn in solution into the plant, the leaves drop off and rot causing a highly alkaline habitat in which only specialized, salt tolerant plants can survive. Vegetative cover in greasewood communities is usually less than 10 percent.

- Samphire-Iodine Bush Community - This community occurs where the combination of high water table and high soil salt content is so great that water often stands in pools of low playas and dense crusts of salt crystals form on soil surfaces and on the bases of plants.

- Great Basin Sagebrush Community - On low foothills at somewhat higher elevations, big sagebrush reach down to make contact with playa chenopods, and upward along ridges and in valley bottoms to mingle with piñon-juniper woodlands. In addition, portions of this community extend well above piñon-juniper to cover rocky ridges and valleys at elevations as high as 10,000 feet. At higher elevations, soils are rocky and less dense, the water table is lower, and soils are free of salts. Vegetative cover is between 20 and 50 percent. Within this community, mountain mahogany (Cercocarpus ledifolius) occurs locally on south-facing slopes in dense stands. At higher elevations, quaking aspen (Populus tremuloides), Douglas-fir (Pseudotsuga menziesii), and white fir (Abies concolor) may occur given moister climates. Limber pine (Pinus flexilis) and spruce (Picea spp.) occur in some parts of Nevada.

Mojave Desertscrub Community - This community is found on the basin floors and bajadas below 4000 feet. South of the Pahranagat Mountains and at the north end of Kane Springs Valley in Nevada, a transition to Mojave desertscrub vegetation occurs (e.g., Links 680, 690, and 700). Creosotebush (Larrea tridentata) is the most abundant plant, with white bursage (Franseria dumosa) as a codominant. Blackbrush (Coleogyne ramosissima) is common at higher elevations. Joshua trees (Yucca brevifolia), all-scale (Atriplex hymenclea), desert holly (A. hymenelytra) and brittlebush (Encelia farinosa) occur locally.

Woodland/Mountain Shrubs/Grasses - Piñon-juniper and the alpine-tundra community are two distinct vegetation types represented by this category.

- Piñon-Juniper - In areas of generally higher elevations (5,000 to 8,000 feet) and steeper slopes, piñon-juniper woodlands dominate the upper foothill landscape. These woodlands or "pygmy forests" are limited along alternative links at higher elevations, primarily intermingling with grasslands and sage scrub (e.g., Links

263, 264, 280, 350, 364, and 460). In many areas, this vegetation type runs continuously from mountain range to mountain range. Annual precipitation in these sites varies greatly. Soils are often rocky, shallow, and poorly defined. Plant cover is often less than 15 percent with most of that existing as upper canopy cover. Grasses, forbs, and woody plants are limited. The most common woody plant is singleleaf piñon (Pinus monophylla). Where juniper (Juniperus osteosperma) dominates, neither singleleaf piñon nor piñon pine (P. edulis) occur, within the study corridors in southern Idaho.

- Alpine-Tundra Community - Above timberline, at elevations exceeding 11,000 feet, low-growing, perennial herbs are virtually the only plant types present. Woody plants are rare or non-existent.

Mountain Conifer/Broadleaf - Two distinct high elevation communities, limber pine - bristlecone pine and quaking aspen, are represented by this category.

- Limber Pine-Bristlecone Pine - This high elevation community occurs between 8,000 and 10,000 feet elevation. Common tree species are white fir (Abies concolor var. lowiana), bristlecone pine (Pinus longaeva var. aristata), limber pine (P. flexilis). This vegetative community has not been specifically identified along any of the links.

- Quaking Aspen - Occurring at elevation ranging from 6,000-8,000 feet, quaking aspen are often found growing in pure stands. Understory conifers generally will eventually grow and shade out the aspen.

Riparian - Riparian areas are encountered infrequently within the alternatives, generally occurring in narrow communities along streams and marshes. Streams in the region traversed by the SWIP alternatives originate from perennial headwater spring sources or from snowmelt which creates numerous ephemeral and a few perennial streams. Typical intermountain vegetation along these waterways is comprised of cottonwoods (Populus spp.), willows (Salix spp.), dogwood (Cornus spp.), wild rose (Rosa spp.), birch (Betula spp.), chokecherry (Prunus spp.), and alder (Alnus spp.) (Links 241, 244, 245, 261, 267, 291, 292, and 620). A unique variety of swamp cedar (Juniperus scopulorum) exists in three known locations including the White River Valley (Link 670) and Spring Valley (Link 380). Climate and elevation will determine which species are present.

Wetlands - Wetlands are also present in the form of marshes and wet meadows within portions of the study area, primarily at lower elevations.

Other Natural Land Cover - Other categories of land cover that have been identified by satellite imagery are natural bare soils and playas. Natural bare soils occur along valleys, in dry areas, dunes, and those areas where vegetation is very sparse. Playas are dry lake beds, often with high mineral content. A majority of the playas are located in Utah with a few scattered in Nevada (e.g., Links 190, 223, 230, 490, 500, 510, 520, 572, 290). None of the links are exclusively within a playa.

Wildlife

Approximately 560 species of vertebrates are likely to occur, over the course of a year, in habitats traversed by alternative corridors. These species are listed in Tables BIO-10 - BIO-15 of the technical reports (refer to Appendix H for the locations where technical reports can be reviewed).

Seventy species of fish are known to occur within aquatic habitats in the project area (refer to Tables BIO-10 - BIO-12 of the technical reports). Native and introduced game fish are present in warm and cold water lakes, ponds and reservoirs, and in perennial streams and rivers. Others inhabit hot and cold springs, and marshes. Approximately 31 percent of the fish fauna occupying waters in the project area are introduced.

Fifteen species of amphibians are expected to occur in aquatic, riparian, and wetland habitats in the project area. Sixty-two species of reptiles potentially occur in terrestrial habitats within the study corridors (refer to Table BIO-13 of the technical reports).

The Biological resources technical report (Table BIO-14 of the technical reports) lists 316 species of birds that potentially occur within habitats in the project area. Of these 109 are most likely to occur in lower elevation swamp/slough areas and 109 (some overlap) are riparian species. Grasslands are habitat for approximately 62 different species and the sagebrush community hosts 81 species. Approximately 71 of the 316 bird species are permanent residents of the area and 143 are summer breeding residents. The remainder are likely to occur only during spring and/or fall migration periods, with a few winter residents.

A total of 111 species of mammals are expected to occur within habitats traversed by the alternative routing corridors of the SWIP (refer to Table BIO-15 of the technical reports). Small mammals including rodents, lagomorphs (rabbits and hares), bats, and shrews are the most numerous, although not readily observed. Over one half of the mammals that may occur in the project area are rodents (51 species). Large mammals include 19 species of carnivores and five species of native ungulates.

Approximately 34 species of vertebrates are not native to the region, introduced through accidental or intentional human activities.

Wild Horses and Burros - Free roaming horses (Equus caballus) and burros (E. asinus) occur on public lands in the project area. These animals are descendants of horses and burros that escaped from man or were turned out onto the open range. None occur within the study corridors.

Desert Tortoise - In recent years, dramatic declines in tortoise population numbers have been observed throughout much of its range, including southern Nevada. A number of factors have contributed to the observed decline including disease, loss of habitat to development, degradation of habitat from livestock grazing, predation on juveniles by ravens attracted to areas where human refuse accumulates, illegal collection, and off-road vehicle (ORV) use. The Mojave population of the desert tortoise was formally listed as a federally threatened species by the FWS in April 1990. Concern has been expressed for the maintenance of viable

populations in Clark County, Nevada, and especially the Las Vegas Valley where rapid commercial and residential development is occurring. As a result of these urban developments affecting desert tortoise, a Habitat conservation Plan is being developed to minimize, monitor, and mitigate impacts to tortoises in the larger Clark County region. The plans currently identify the Coyote Spring valley as a priority area for preservation of the species (Regional Environmental Consultants 1991). Desert Tortoise do not occur in Idaho or in the Utah portion of the SWIP.

Sage Grouse - Declines in sage grouse numbers are largely associated with destruction of sagebrush habitat. Conversion of sagebrush to agricultural lands, and attempts to convert sagebrush areas to grassland for livestock grazing are a few of the human developments contributing to the decrease in grouse numbers. There has been concern expressed by state and federal agency biologists for other activities that would further impact the sage grouse populations.

Aquatic/Riparian Habitats

Idaho - Important aquatic/riparian habitats traversed by SWIP alternatives or located in close proximity to project alternatives including the Snake River, Salmon Falls Creek and reservoir, Little Wood River, Deep Creek, Cottonwood Creek, Goose Lake, Wilson Lake Reservoir, and Deep Creek Reservoir.

Nevada - Aquatic/riparian habitats traversed by SWIP alternatives or in close proximity to project alternatives include the Humboldt River and tributaries, Salmon Falls Creek, Trout Creek, Shoshone Creek, Thousand Springs Creek, Bishop Creek and Reservoir, Duck Creek, Steptoe Creek and associated springs, Bassett Lake, Spring Valley Creek, the White River, Ellison Creek, Forest Home Creek, Whipple and Tule Field Reservoirs and Goshute Creek.

Several wetland areas traversed by SWIP alternatives serve as nesting and wintering grounds for waterfowl and bald eagles. These occur in areas of Spring Valley, Steptoe Valley, White River Valley and Bassett Lake. Wetlands associated with Bassett lake are nesting habitat for white-faced ibis, long-billed curlew, and sandhill crane.

Natural springs and streams which are habitat for a number of sensitive fish species include Goshute Creek, Duck Creek, and associated springs of Steptoe Valley, Spring Valley Creek , and associated springs of Spring Valley, the White River, and springs of White River Valley and Town Creek.

Utah - Significant aquatic/riparian habitats that occur within SWIP alternatives in Utah include the Sevier River and tributaries, Sevier Lake, Topaz Slough, Crafts Lake, Baker Creek, Jensen Spring, Rocky Knoll Spring, Coyote Spring, Gandy Salt Marsh lake, Leland-Harris Spring Complex, and Miller Spring.

Leland-Harris Spring Complex and Miller Spring occur within several miles of Link 63 in Snake Valley. These areas are habitat for four sensitive species: the desert dace, least chub,

spotted frog, and Great Basin silver spot butterfly. The latter three are candidates (Category 2) for federal listing as threatened or endangered.

Special Status Species - Plants

Seventy plant species, which occur or potentially occur along proposed corridors, have been identified as sensitive on the state and/or federal level (refer to Tables BIO-16, 17, and 18 in the technical report). There are no known plant species occurring within the SWIP proposed corridors that are presently listed as threatened or endangered on the federal level. Candidate species in the area include two that are Federal Category 1 (C1), 33 are Federal Category 2 (C2), and 35 are recommended for deletion Federal Category (C3). C1 means that substantial information exists to support proposing the species for listing as threatened or endangered, and a listing proposal is being or will be prepared. C2 indicates that listing of a species may be appropriate when additional information is gathered. The C3 category means that species that were once considered for listing are no longer being considered.

The listing used was the Federal Register 50 CFR Part 17, Wednesday, February 21, 1990. Most are found on at least one state list of species of concern. Although many of the species are not legally protected by the Endangered Species Act, they are protected by federal agency policies and regulations.

Known locations of 31 of the 70 plant species occur along, or within one mile, of alternative routes. The low number of known plant locations in the area is more likely a function of the lack of field research and does not preclude the existence of additional species.

Idaho - Sixteen sensitive plant species have been identified as occurring or potentially occurring within the proposed SWIP corridors in Idaho. According to the most recent data available, none of these species are currently listed as threatened or endangered on the federal level. Of the sixteen species, three are federal Category 2 and one is C3. The State of Idaho identifies various levels of sensitivity as discussed below. Table BIO-16 in the Technical Report lists these 16 plants.

Three plants are classified as C2 on the federal level. One species of milk-vetch, Mulford's milk-vetch (Astragalus mulfordiae), is known from several counties, including Owyhee County (Moseley and Groves 1990). It grows on well-drained, deep, sandy soils on south-facing slopes (Rosentreter 1990). Davis' peppergrass (Lepidium davisii) occurs along internally drained, hard-bottomed playas. These playas are often used for stock watering ponds and race tracks. Montane peppergrass (L. montanum var. papilliferum), known from Owyhee County can tolerate harsh conditions where other plants are unable to take root (Rosentreter 1990).

The categories utilized to identify state sensitive species are defined by The Idaho Native Plant Society. One species, wovenspore lichen (Texosporium sancti-jacobi), is considered state priority 1. It is part of an effort to identify rare non-vascular plants in Idaho (Moseley and Groves 1990). Only recently found in Idaho, it grows on decomposed grasses and on the underside of very old rabbit pellets where humidity is high (Rosentreter 1990).

Two-headed onion (Allium anceps), four-wing milk-vetch (Astragalus tetrapterus) and dimersia (Dimersia howellii) are listed as State Priority 2. Two-headed onion requires moist habitat and areas that are inundated in the spring. Four-wing milk-vetch is found in association with piñon-juniper at elevations of 3,500 to 6,500 feet. It is known from one site in Twin Falls County, Idaho and is being threatened by off-road vehicles and trampling. Dimersia is known from a limited number of sites in Owyhee County.

Owyhee morning milk-vetch (Astragalus atratus var. owyheensis) is a state sensitive species. Generally found on steep hillsides and flats over basalt, it is often entangled under sagebrush. Threats include range improvement and agricultural development. Other state sensitive species are Torrey's blazing star (Mentzelia torreyi var. acerosa); Webber's needlegrass (Stipa webberi), which also may be more common than previously known (R. Moseley 1990); and, thistle milk-vetch (Astragalus kentrophyta var. jessiae), known from a limited number of sites in southern Idaho.

Two species being monitored at the state level are Murphy milk-vetch (Astragalus mulfordiae) and white eatonella (Eatonella nivea).

Two species are Category 3. Picabo milk-vetch (Astragalus oniciformis), a BLM sensitive species that may be extinct, and Murphy milk-vetch (A. camptopus), found in arid, sandy soils of southeastern Idaho in association with shadscale (Clark 1989). A primrose (Primula cusickiana), is currently undergoing taxonomic review and has no status at this time.

Nevada - Forty-five plant species in Nevada that have been identified by various agencies as requiring special consideration (Table 17 in the Technical Report). Status information on the state level is from "Endangered, Threatened and Sensitive Plants of Nevada" updated February 13, 1989. There are no federally-listed threatened or endangered plant species known to occur or potentially occur within the proposed SWIP corridors in Nevada.

Monte Neva paintbrush (Castilleja salsuginosa) is a Category 1 species and critically endangered on the state list. It is found at Monte Neva Hot Springs in Steptoe Valley. Sand-loving buckwheat (Eriogonum argophyllum) is listed as Category 1 on the federal level, and critically endangered on the state level. It is located in the Ruby Valley area (Lindsey 1989).

Clokey milk-vetch (Astragalus aequalis) is a C2 species, recommended as threatened by the Northern Nevada Native Plant Society (NNNPS). It is found on gravelly hillsides and ridges at elevations ranging from 5,900 to 8,400 feet. Smooth stickleaf (Mentzelia mollis) is a C2 species, recommended for deletion by NNNPS. Three-cornered pod Geyer milk-vetch (Astragalus triquetrus) is a C2 species, listed as threatened by NNNPS (1989) and critically endangered by the State of Nevada. It grows in sandy soils on dunes or in washes. Known locations are along the southern extension in the Dry Lake Valley.

There are 16 species on the federal Category 2 list, which are also on the NNNPS watch list. Exact locations for most of these are unknown, although habitats supporting known populations are similar to those traversed by proposed SWIP corridors. Therefore, the potential for occurrence of several different species of concern exists. Sunnyside green gentian (Frasera gypsicola), a C2 species, is a mound-forming plant found within remnant playas. Known locations include White Pine and Nye counties. Welsh's catseye (Cryptantha

welshii) is the C2 species with the highest potential for occurrence (Walker 1989). It has been located in Jake's Valley and is likely to be found within one mile of the proposed corridor due to similar habitat types.

Those Category 2 species with moderate potential for occurring along proposed corridors include maguire lewisia (Lewisia maguirei) and Blaine's pincushion (Sclerocactus blainei). Maguire lewisia is found on loose soils associated with piñon-juniper at elevations of 7,500 to 7,800 feet. Blaine's pincushion is currently not well documented. It is found in association with greasewood-shadscale. The Cactus and Yucca Law would apply to any found in the affected area. Jan's catchfly (Silene nachleringae), another newly described species, is found at elevations above 9,500 feet with subalpine vegetation.

Long calyx milk-vetch (Astragalus oophorus var. lonchocalyx) has low to moderate potential for occurrence (Walker 1989). It is located on dry, gravelly hillsides in association with piñon-juniper and sagebrush.

There are five species with low potential for occurrence. Eastwood milkweed (Asclepias eastwoodiana) is found on low alkaline clay hills away from other plants. Peck station milk-vetch (Astragalus eurylobus) grows in semi-badland sites with Utah juniper and black sagebrush. Currant milk-vetch (A. uncialis) is found on dry knolls and slopes at elevations of 5,300 to 6,050 feet. Sheep fleabane (Erigeron ovinus) grows on rocky outcrops at elevations exceeding 6,500 feet. Tuffed globemallow (Sphaeralcea caespitosa) is found on gravelly limestones with mixed shrub and piñon-juniper grass communities.

Seven additional C2-listed species, include several which are newly described making it difficult to discern the actual sensitivity of the species. The following descriptions are based on available information. Elko rock-cress (Arabis falcifructa) is found in barren or sparsely vegetated areas in Elko County and is of concern in the Wilkins area (BLM 1990). Grouse Creek rock-cress (A. falcatoria), also in Elko County, is found in high elevation coniferous forests. Goose Creek milk-vetch (Astragalus anserinus) is located in Elko County on undeveloped soils along Goose Creek and at Thousand Springs (BLM 1990). Broad fleabane (Erigeron latus) is found on gravelly or rocky hillsides, not enough is known about this species to make definite statements about its sensitivity (USDI, BLM 1989). Arching pussytoes (Antennaria arcuata) grows in meadows that are not permanently wet and in riparian areas. Lewis buckwheat (Eriogonum lewisii), is known on gravelly steep slopes. Barren valley collomia (Collomia renacta) is found in "badland areas" and is of concern in the Pequop Summit area (BLM 1990).

Six C2 species exist which may occur on the southern extension to Las Vegas. Merriam or white bear poppy (Arctomecon merriami), found on shallow gravelly soils, it is threatened by land development. Golden bear poppy (A. californica), considered critically endangered by the State, is found in gravelly desert flats in association with creosotebush. Alkali mariposa (Calochortus striatus) is found in alkali meadows in association with saltgrass. Beaverdam breadrood (Pediomelum castoreum), recently listed (January 1992) is known to occur in sandy gravels of the Mojave Desert. It is known to occur along Kane Springs Wash (Link 680). Two subspecies of penstemon (Penstemon bicolor var. bicolor, P. bicolor var. roseus) occur next to the Dry Lake substation site in the Dry Lake Valley. Both are known from

shallow, gravelly soils and appear to survive in disturbed areas (Mozingo 1980). The first variety is a watch species; the latter is recommended for deletion on the state level.

Blaine's pincushion, Clokey pincushion (Coryphantha vivipera var. rosea), and Great Basin fishhook (Sclerocactus pubispinus) are the three species of cactus specifically listed. All species of cactus and yucca are protected by The Cactus and Yucca Law, Nevada State Law (Revised Statutes 527). There are known populations of Great Basin fishhook along several of the links in the eastern part of the state. The proposed corridors may cross some healthy populations of cactus or yucca.

Eleven of the species identified are listed as 3C on the federal level. Habitat descriptions are given in Appendix C.

Two tree species merit mentioning. Bristlecone pine (Pinus aristata) occurs in eastern Nevada, found on dry, rock slopes and ridges of high mountains at elevations exceeding 7500 feet. They are classed among the oldest known living plants and can provide important historical information. Additionally, a rare variety of juniper, known as swamp cedar (Juniperus scopulorum), occurs in White River Valley east of one link.

Utah - Thirteen species of sensitive plants that are known to occur, or have the potential to occur, within the proposed corridors of SWIP (Table 18 in the Technical Report). According to the most recent data available, none of these species are listed as threatened or endangered on the federal or state level.

Nine species are C2 on the Federal level. Compact catseye (Cryptantha compacta), recently downgraded from a C1 species, is found within Millard County in association with desert scrub and grassland. Sunnyside green gentian (Frasera gypsicola) is considered extremely rare globally and statewide. The taxonomy is undergoing revision and may also be referred to as White River swertia (Swertia gypsicola) (Young 1989). Known locations include Millard County. Sand-loving buckwheat (Eriogonum ammophilum), associated with desert scrub, most likely occurs within the SWIP corridors. Frisco clover (Trifolium andersonii var. friscanum) is an S1 (S3) species, with this particular subspecies considered rare. It is found at elevations of 7,000 to 7,500 feet in association with piñon-juniper in Millard County.

Known locations of currant milk-vetch (Atragalus uncialis) exist near Delta, Utah. This species is found on dry knolls and slopes in limestone derived soils. Depressed bitterweed (Hymenoxys depressa) is undergoing taxonomic recombination resulting in a more extended range than previously defined (Boyce 1989.) It is found in association with black sagebrush. Tunnel Springs beardtongue (Penstemon concinnus) is known to occur in Millard County, although it may be south of proposed corridors. Jones globemallow (Sphaeralcea caespitosa) has been identified as occurring within a proposed corridor (USDI, BLM 1989). It is found on calcareous soils in association with mixed shrub and piñon-juniper communities at elevations of 5,000 to 6,500 feet.

The remaining five plants listed are categorized as 3C which indicates that they are no longer candidates for listing because they are more abundant than previously believed or have no federal status. They should still be taken into consideration, as the State of Utah lists several

of them as species of concern. Calloway milk-vetch (Astragalus callithrix) and terrace buckwheat (Eriogonum natum) are listed as S2. Their ranges include Millard County. Limestone buckwheat (E. eremicum) and Great Basin pincushion (Sclerocactus pubispinus) have not been ranked on the state level yet. Both are found in Millard County. Transmission lines are listed as a threat to limestone buckwheat, and harvesting for horticultural purposes threatens the Great Basin pincushion. Low beardtongue (Penstemon nanus) is found in Juab, Millard, and Toole counties.

Special Status Species - Wildlife

The FWS and the states of Idaho, Nevada, and Utah have all devised codes for defining the extent of rarity and level of threat to biotic taxa that are included on species lists maintained by each governmental entity. Definitions of these codes may be found in the technical reports. Concern for the species discussed below has been expressed by agencies contacted during the biological resource inventory.

Idaho - Federally-listed wildlife species known to occupy habitats within the study corridors include the bald eagle, (Haliaeetus leucocephalus) and peregrine falcon (Falco peregrinus anatum). Refer to Table BIO-19 in the technical reports for a list of special status wildlife species in the project area in Idaho.

Candidates for federal listing (Category 2) include one species of fish, the Shoshone sculpin (Cottus greenei) and five species of birds: long-billed curlew (Numenius americanus), ferruginous hawk (Buteo regalis), Swainson's hawk (Buteo swainsoni), Western yellow-billed cuckoo (Coccyzus americanus occidentalis), and white-faced ibis (Plegadis chihi). The spotted bat (Euderma maculatum) is the only candidate species of mammal known to occur in the project area in Idaho.

Species identified as sensitive or of concern to state agencies are sage grouse (Centrocercus urophasianus), burrowing owl (Athene cunicularia), and pronghorn (Antilocapra americana).

No specific locations of habitat for Swainson's hawk, yellow-billed cuckoo, white-faced ibis or spotted bat were identified within the study corridors. Although other species mentioned above occur within the SWIP study corridors, no specific locations of nests and/or crucial habitats were identified, with the exception of Shoshone sculpin and sage grouse strutting grounds.

Nevada - Federally-listed species identified within the study corridors include the desert tortoise (Gopherus agassizii), White River spinedace (Lepidomeda albivallis), bald eagle, and peregrine falcon. See Table BIO-20 in the technical reports for a detailed list of special status wildlife species in the project area in Nevada. The desert tortoise, bald eagle and peregrine falcon are included in the Biological Assessment being prepared for the SWIP.

Candidates for federal listing (Category 2) in the project area in Nevada include two butterflies, the Baking Powder Flat blue butterfly (Euphilotes battoides spp.) and Mattoni's blue butterfly (E. pallescens mattoni). Candidate fish species include: White River desert

sucker (Catostomus clarki intermedius), White River speckled dace (Rhinichthys osculus spp.), Pahranagat speckled dace (R. o. velifer), Lahontan speckled dace (R. o. robustus), Preston White River springfish (Crenichthys baileyi albivallis), relict dace (Relictus solitarius), and Bonneville cutthroat trout (Salmo clarki utah).

One species of amphibian, the Arizona (southwestern) toad (Bufo microscaphus), and one species of reptile, the chuckwalla (Sauromalus obesus), are classified as a federal Category 2 species.

Category 2 bird species include long-billed curlew, ferruginous hawk, Swainson's hawk, western snowy plover (Charadrius alexandrius nivosus), western yellow-billed cuckoo, and white-faced ibis. The Fish and Wildlife Service (FWS) has received a petition requesting the listing of the ferruginous hawk as a threatened species. This species is included in the Biological Assessment being prepared for the SWIP.

Category 2 mammal species identified in the project area are the spotted bat (Euderma maculatum) , Desert Valley kangaroo mouse (Microdipodops megacephalus albiventer), Sierra Nevada red fox (Vulpes vulpes necatur), North American wolverine (Gulo gulo luscus), and North American lynx (Felis lynx canadensis).

Species classified as sensitive or of concern to state agencies include burrowing owl, sandhill crane (Grus canadensis), sage grouse, golden eagle (Aquila chrysaetos), Gambel's quail (Lophortyx gambelii), bighorn sheep (Ovis canadensis), pronghorn, elk, and mule deer (Odocoileus hemionus).

The breeding range of the loggerhead shrike occurs throughout the study area. The chuckwalla (Sauromalus obesus) is a resident of Mojave desertscrub communities. Chuckwallas prefer rocky hillside areas, particularly lava flows. Link 720 traverses chuckwalla habitat in the Arrow Canyon Range. Both species are Category 2 candidates for federal listing.

The burrowing owl is a species of concern to the Nevada Department of Wildlife. Burrowing owls occur in Mojave desertscrub habitat and, therefore, could occur on Links 690, 700, and 720. Burrowing owls often use desert tortoise burrows and could be found throughout all tortoise habitat.

No locations of habitat were identified within the SWIP study corridors for: Arizona toad, western snowy plover, yellow-billed cuckoo, white-faced ibis, Desert Valley kangaroo mouse, spotted bat, red fox, wolverine, lynx, White River springfish, White River spinedace, or Mattoni's and Baking Powder Flat blue butterflies.

Utah - Two federally-listed species occur in the project area in Utah, the bald eagle and peregrine falcon. Refer to Table BIO-21 in the technical reports for list of special status wildlife species in the project area in Utah.

A number of species are candidates for federal listing (Category 2). These include invertebrates such as the Great Basin silver spot butterfly (Speyeria nokomis nokomis) and a

Category 2 species of amphibian, the western spotted frog (Rana pretiosa). Category 2 fish species include the Bonneville cutthroat trout, and least chub (Iotichthys plegethontis).

Category 2 bird species occurring in Utah are the ferruginous hawk, Swainson's hawk, western snowy plover, western yellow-billed cuckoo, and white-faced ibis. Only one Category 2 mammal species, the spotted bat is known to occur in the project area in Utah.

Species identified as sensitive or of state concern include the golden eagle, pronghorn, and mule deer.

No specific locations of habitat were identified within SWIP corridors in Utah for bald eagle, peregrine falcon, Swainson's hawk, western yellow-billed cuckoo, white-faced ibis and spotted bat.

Alternative Routes - Midpoint to Dry Lake

Route A

Wildlife - From the Midpoint Substation to the Idaho-Nevada state line (Links 10, 20, 40, 41, 50, and 70) near Eden, Hansen, and Rogerson would traverse habitat for burrowing owls, long-billed curlew nesting populations, ferruginous hawks and pronghorn in Idaho. Sage grouse leks and wintering grounds would also be north of Jackpot, Nevada (Link 70).

Numerous links on the route segment from Jackpot to Robinson Summit would traverse crucial big game habitats including crucial pronghorn winter range from Jackpot to southwest of Wilkins (Links 72, 101, 102, 110, 130, 160, 161, 162), crucial mule deer winter range from Jackpot to Knoll Creek Area (Links 72, 101, 102, 110, 130) and Toano Draw and Goshute Valley (Links 200, 211, and 212), crucial pronghorn yearlong and summer habitat in the Steptoe Valley (Link 241), and pronghorn kidding grounds adjacent to Raiff (Link 291). Sage grouse leks and wintering grounds also occur on many alternatives (Links 72, 100, 110, 160, 161, 162, 1612, 200, 211, 212, 243, 291, and 293). Habitat for long-billed curlew and sandhill crane is encountered in Steptoe and Spring valleys (Links 241, 243, 245, 261, 270, 291, and 293). Bald eagle winter habitat occurs on numerous links along this route. An area of potential nesting habitat occurs where this route would cross Salmon Falls Creek Canyon (Link 72). Other species that occur on a limited number of links are Bonneville cutthroat trout in the Steptoe Valley (Link 241), relict dace (Links 241 and 291), and ferruginous hawk nests in the Egan Range (Link 293) on this route. Route A would follow an existing transmission line where the cumulative effects of raptor predation on sage grouse (Links 72, 101, 102, 110, 130, 160, 161, and 162) would be expected to be reduced. Route A, and all the other alternative routes (Midpoint to Dry Lake) would converge just north of Robinson Summit (Link 310).

From the Robinson Summit substation site south to the Dry Lake substation site, all the routes would follow the same links. A large number of ferruginous hawk nest sites occur on or near the route northwest of Riepetown (Link 340) and near Coyote Wash (Link 673). Other important raptor habitats include golden eagle nests and bald eagle winter habitat in

the vicinity of Gap Mountain (Link 672), burrowing owl nesting (Link 363), and crucial raptor (cliff nesting species) nesting areas in the Horse Range (Links 669, 670) and the vicinity of Gap Mountain (Link 672). Extensive areas of mule deer winter use and migration areas are encountered on this part of the route (Links 670, 672, and 673). Sage grouse leks are traversed by alternatives near the north end of White River Valley (Link 340 and 669).

Route A would traverse Mojave desert scrub vegetation in southern Nevada and would encounter habitat for bighorn sheep, desert tortoise, gambel's quail near Delamar Valley (Link 690), Pahranagat Wash (Link 690), Arrow Canyon Range (Link 670), and sandhill crane habitat (Links 690, 670).

Plants - Route A would cover approximately 314 miles (61 percent) of sage scrub and 108 miles (21 percent) of grassland. Sage scrub, as mapped, represents four identified communities: Great Basin sagebrush on the lower foothills, shadscale at low elevation saline basins, greasewood in saline soils, and samphire/iodine bush. Samphire/iodine bush is a unique plant community found where salt crystals form on the soil as a result of pooling water. Great Basin sagebrush is the most common, and is not highly sensitive. Grassland communities, characterized by cheatgrass brome and crested wheatgrass, are found largely ecotonal with other plant communities. Approximately, eight percent of the land that would be crossed is agricultural, including prime farmlands. The route would cross a small area of riparian (less than one percent) along 26 perennial streams which are crossed. Less than one percent of the route would traverse higher elevation piñon-juniper communities.

From Ely to the Dry Lake substation site, the route would traverse the northern portion of Delamar Valley (Link 690) through sage scrub, most likely blackbrush and other cooler, Great Basin desert scrub species. Where the route would pass the southern edge of Pahranagat Mountains, there is a distinct transition to Mojave desert scrub, characterized by creosote/bursage with some Joshua trees locally present. The route would cross approximately 56 miles (10 percent) of Mojave Desert Scrub.

Four plant species of concern occur along 1.3 miles of the centerline of Route A and four occur within one mile on either side of the centerline. In Idaho, four-wing milk-vetch (Astragalus tetrapterus) is found on the centerline east of Browns Bench (Link 70), and populations of two-headed onion (Allium anceps) occur on the centerline southwest of Eden (Link 41) and within one mile of centerline (Link 70). Both are Priority 2 in the State. In Nevada, Elko rock-cress (Arabis falcifructa), a Category 2 species, occurs within one mile of the route east of the Thousand Springs Valley (Link 162). In the Steptoe Valley less than one mile east of the route, Monte Neva Hot Springs (Link 291) provides habitat for monte neva paintbrush (Castilleja salsuginosa), a Category 1 species, critically endangered in the Nevada.

Three plant species occur on the route from the Ely area to Dry Lake substation site. One-leaflet Torrey milk-vetch (Astragalus calycosus var. monophyllidius), a watch species, is found on the centerline of the route through Jakes Valley (Link 670). A watch species called Meadow Valley range sandwort (Arenaria stenomeres) occurs on the route, and a Category 2 species called smooth stickleaf (Mentzelia mollis) occurs within the one mile of the route in the Arrow Canyon Range (Link 700). Penstemon bicolor, P. b. roseus and Astragalus triquestus are Category 2 candidate species which could occur on Links 690, 700, and 720.

Route B

Wildlife - From Midpoint Substation to Jackpot, Nevada, Route B is the same as Route A. South of Jackpot, this route would turn southeast through Trout Creek (Links 91, 92, 140, 141, 142, and 144) instead of paralleling the existing transmission lines south where it would encounter sage grouse leks. Route B route would encounter more sage grouse leks in Toano Draw (Link 200) and Goshute Valley (Links 221, 226), and again in the Steptoe Valley (Link 259) and Butte Valley (Link 280). Big game habitat on this route includes mule deer crucial winter range along the Toano Range and Goshute Mountains (Link 200, 222), and crucial summer habitat near Trout Creek (Link 91). Important raptor habitats include peregrine falcon winter habitat (Links 222, 224, and 226), bald eagle winter habitat (Links 259, 260), and ferruginous hawk habitat (Links 259, 260) and nest sites within the Butte Valley (Link 280). Habitat for long-billed curlew and sandhill crane would be encountered in Steptoe Valley (Links 259, 260, 270, and 261). An important water use area comprised of Antone Creek and surrounding springs is traversed by this route in Antone Pass (Link 280). The waters are important for wildlife, especially mule deer and sage grouse. From the Robinson Summit substation site to the Dry Lake substation site, Route B is the same as Route A.

Plants - Route B would traverse approximately 331 miles (64 percent) of sage scrub and 97 miles (18 percent) of grassland. Other plant communities crossed include agricultural land (8 percent), and less than one percent of both piñon-juniper and riparian areas. Twenty-seven perennial streams are crossed. The community types and vegetation described for Route A from the Robinson Summit substation site to the Dry Lake substation site also apply to Route B.

The four plant species of concern that occur along approximately 1.3 miles of the route include four-wing milk-vetch (Astragalus tetrapterus) east of Browns Bench (Link 70), two-headed onion - (Allium anceps) southwest of Eden (Link 41), One-leaflet Torrey milk-vetch (Astragalus calycosus var. monophyllidius) within the White River Valley (Link 670), and Meadow Valley range sandwort (Arenaria stenomeres) within the Coyote Spring Valley (Link 700). These species are identical to those discussed in Route A. One species that occurs in Nevada within the one mile zone adjacent to the Toano Range and Goshute Mountains (Link 222) is Great Basin fishhook (Sclerocactus pubispinus). Though it is a Category 3 species, it is protected by the Cactus and Yucca Law in Nevada.

Route C

Wildlife - From Midpoint Substation to north of (Link 200), Route C is the same as Route B. From the crossing of Interstate 80 (Link 211) to Dolly Varden (Link 230), Route C is the same as Route A. Link segment 250 is unique to Route C. Route C would traverse crucial pronghorn winter range in the Currie Hills (Link 250) and would also cross sage grouse leks and bald eagle habitat. From the North Steptoe substation site to the Dry Lake substation site, Route C is the same as described for Route A.

Plants - Route C traverses approximately 320 miles (63 percent) of sage scrub and 96 miles (19 percent) of grassland. Approximately eight percent of the area that would be crossed by

this route is agricultural. The remainder is less than one percent is piñon-juniper and less than one percent riparian. Twenty-three perennial streams would be crossed. Refer to Route A for a discussion of the communities and specific description of the Mojave desertscrub found south of the Pahranagat Mountains.

Plant species of concern occur along 1.3 miles of the centerline, as discussed in Route A. Species occurring within the one mile area are Castilleja salsuginosa (Link 291) near Monte Neva Hot Springs in Steptoe Valley, Allium anceps (Link 41) near Dry Gulch in Idaho, and Mentzelia mollis (Link 700) in the Arrow Canyon Range south of Ely.

Route D

Wildlife - From Midpoint Substation to just north of HD Summit, Route D is the same as Route A. From HD Summit to approximately Town Creek, Route D would follow an existing transmission line roughly parallel to U.S. Highway 93 (Link 167) and would traverse crucial pronghorn winter range southwest of Wilkins near Bishops Creek (Link 1611), sage grouse leks west of the Windermere Hills (Link 167) and near Interstate 80 east of Wells (Links 180), long-billed curlew habitat southeast of Wells (Links 180, 190), crucial deer winter range in Independence Valley (Link 180, 190), and in the Goshute Valley north of Dolly Varden (Link 230).

From Dolly Varden to the North Steptoe substation site (Link 241, 243, and 245), Route D would traverse antelope crucial summer range and antelope yearlong habitat. From the North Steptoe substation site to the Dry Lake substation site, Route D is the same as Route A.

Plants - Route D would traverse approximately 319 miles (62 percent) of sage scrub and 97 miles (19 percent) miles of grassland. Approximately eight percent of the land that would be crossed is agricultural. Other communities consist of less than one percent piñon-juniper and less than one percent riparian areas. Refer to Route A for a discussion of the communities and specific description of the Mojave desert scrub found south of the Pahranagat Mountains.

Plant species of concern occur along 1.3 miles of the assumed centerline, as discussed in Route A. Those within the one mile zone are also the same as those described for Route A (Links 41, 162, 291, and 700).

Route E

Wildlife - From Midpoint Substation to north of Interstate 80 (Link 200), Route E is the same as Route A. From north of Interstate 80 to the North Steptoe substation site (Links 221, 222, 224, 226, 259, 260, 261, and 270), Route E is same as Route B. From the North Steptoe substation site to the Dry Lake substation site, Route E is the same as Route C.

Plants - Route E would traverse approximately 320 miles (61 percent) of sage scrub and 116 miles (22 percent) of grassland. Agricultural lands constitute approximately 9 percent of the

land that would be crossed. Piñon-juniper and riparian communities constitute less than one percent of the land that would crossed. The route would cross 22 perennial streams. Refer Route A for a description of the communities and a description of the Mojave desert scrub found south of the Pahranagat Mountains.

Plant species of concern that occur along 1.3 miles of the route are identical to those discussed for Route A. Monte neva paintbrush (Castilleja salsuginosa) found near Monte Neva Hot Springs in Steptoe Valley (Link 291), smooth stickleaf (Mentzelia mollis) in the Arrow Canyon Range (Link 700), and two-headed onion (Allium anceps) near Dry Gulch (Link 41) in Idaho occur within the one mile the route. Great Basin fishhook (Sclerocactus pubispinus) appears adjacent to the Toano Range and Goshute Mountains (Link 222).

Route F

Wildlife - Route F would traverse west from Midpoint Substation (Links 61, 62). Near the Hagerman, the route would traverse habitat for burrowing owl, long-billed curlew nesting populations, and Shoshone sculpin. North and west of Hagerman, the route would traverse sage grouse leks, habitat for pronghorn and river otter at the Snake River (Link 62). Adjacent to the Hagerman Fossil Beds National Monument (Link 64), the route would also traverse several cooperative wildlife tracts that are managed for game birds, such as pheasant. Where the route would parallel Salmon Falls Creek Canyon, some long-billed curlew and burrowing owl habitat occurs.

From Jackpot, Nevada to north of Interstate 80 in Goshute Valley, Route F is the same as Route B. Then, the remainder of this route to Dry Lake substation site is the same as described for Route C.

Plants - Route F would traverse approximately 317 miles (60 percent) of sage scrub and 110 miles (20 percent) of grassland. Approximately 11 percent of the land that would be crossed by this route is agricultural. Other plant communities that would be crossed consist of less than one percent piñon-juniper and less than one percent riparian. Eight perennial streams would be crossed. Refer to Route A for a description of the plant communities a description of the Mojave desert scrub found south of the Pahranagat Mountains.

Plant species of concern occur along approximately 4.2 miles of the route. In Idaho, mourning milk-vetch (Astragalus atratus var. inseptus) occurs near Peters Gulch (Link 64), Lepidium davisii occurs from near Salmon Creek Falls Creek Reservoir (Link 64), two-headed onion (Allium anceps) east of Browns Bench (Link 70), and four-wing milk-vetch (Astragalus tetrapterus) adjacent to Salmon Falls Creek (Link 64, 70). In Nevada, one-leaflet Torrey milkvetch (A. calycosus var. monophyllidius) occurs in Jakes Valley (Link 670) and Arenaria stenomeres occurs in Coyote Spring Valley. Other species known to exist within the one mile corridor are Torrey's blazing star (Mentzelia torreyi var. acerosa) northwest of Hagerman (Link 62), Davis peppergrass (M. mollis) in the Coyote Spring Valley and Arrow Canyon Range (Link 700), and Owyhee mourning milkvetch (Astragalus atratus var. owyheensis) adjacent to Salmon Falls Creek (Link 64).

Route G

Wildlife - From Midpoint Substation to Jackpot, Nevada, Route G is the same as Route A. Route G would cross Salmon Falls Creek through the foothills west of Jackpot (Links 711, 714) and would traverse sage grouse leks and wintering grounds, crucial pronghorn and mule deer winter habitat, and bald eagle nesting and winter habitat.

From Jackpot to the Robinson Summit substation site, Route G is the same as Route A, except Route G uses Links 713 and 715 near Contact Nevada and Links 150 and 151 near Wilkins. Wildlife habitats the would be traversed are essentially the same as those which occur on Links 72, 101, and 102 as described for Route A. In Thousand Springs Valley (Links 150, 151), the route would traverse two sage grouse leks, skirt the edge of another sage grouse lek buffer, and cross an area of pronghorn winter range. From the North Steptoe substation site to the Robinson Summit substation site, Route G is the same as Route B.

From Robinson Summit substation to Dry Lake wildlife habitats traversed by Links 363 through 700 are the same as those discussed for these links on Route A.

Plants - Route G would traverse approximately 312 miles (62 percent) of sage scrub and 97 miles (19 percent) of grassland. Other plant communities the would be crossed include approximately 16.8 miles (3 percent) of agricultural land, less than one percent piñon-juniper at higher elevations, and less than one percent riparian. The route would cross about 78 miles (16 percent) Mojave desert scrub along the southern portion. Plant communities and vegetation types are the same as those described for Route A.

The four plant species of concern that occur along approximately 1.3 miles of the route include four-wing milk-vetch (Astragalus tetrapterus) east of Browns Bench (Link 70), two-headed onion - (Allium anceps) southwest of Eden (Link 41), One-leaflet Torrey milk-vetch (Astragalus calycosus var. monophyllidius) within the White River Valley (Link 670), and Meadow Valley range sandwort (Arenaria stenomeres) within the Coyote Spring Valley (Link 700). These species are identical to those discussed in Route A. Elko rock-cress, a Category 2 species, occurs within one mile of the route in the Thousand Springs Valley (Link 151).

Alternative Routes - Ely to Delta

Direct Route

Wildlife - The Direct Route would originate from the North Steptoe substation site, crosses the Schell Creek Range and continue past the Red Hills to a point south of the Little Hills (Links 262, 263, 265 and 266). This route would cross near areas of ferruginous hawk, long-billed curlew, bald eagle habitat, sage grouse wintering grounds, and lek and crucial pronghorn winter range.

Where this route would traverse the Snake Valley (Link 630), sensitive aquatic/wetland habitats are encountered. One of these, the Leland-Harris Spring Complex is inhabited by

least chub, desert dace, and spotted frog. Wetland areas associated with this spring complex are also habitat for the Great Basin silver spot butterfly. Crucial deer winter habitat would be traversed by this route in the House Range (Link 630). Crucial mule deer winter habitat and a migration corridor would also be encountered in the Drum Mountains (Links 630, 650). The route would traverse pronghorn habitat north of Sugarville (Link 582) at the Intermountain substation site.

Plants - The Direct Route would traverse a mosaic of sage scrub for approximately 83 miles (64 percent) and grassland communities for 27 miles (20 percent). The route would cross approximately 21 miles (16 percent) of playa in Utah. No sensitive plant species are known to occur within the one mile the route.

Cutoff Route

The Cutoff Route is the same as the Direct Route from the North Steptoe substation site to just south of the Little Hills. The route would then continue southwest across the Snake Valley (Link 266).

Wildlife - A number of raptor nesting areas would be traversed by this route including golden eagle nest sites within the Snake Valley (Link 268) and Tule Valley (Link 462). Ferruginous hawk nests also occur in the Tule Valley (Link 462). Crucial water Mule deer winter range and migration corridors occur in the Confusion Range and Middle Range (Link 462) and a mule deer migration corridor is traversed in the Congor Range (Link 268). Other important wildlife habitats include critical pronghorn habitat and crucial water use areas in the Snake Valley (Link 268). The route would traverse pronghorn habitat west of Smelter Hills (Links 571) and north of Sugarville (Link 582) at the Intermountain substation site.

Plants - The Cutoff Route would traverse a mosaic of sage scrub for approximately 101 miles (66 percent) and grassland communities for 34 miles (22 percent). The route would cross approximately 18 miles (12 percent) of playa in Utah. No sensitive plant species are known to occur along within the study corridor.

230kV Corridor Route

Wildlife - The 230kV Corridor Route would originate form the Robinson Summit substation site and parallel a 230kV transmission line east toward Ely, Nevada (Link 350). The route would traverse sage grouse leks and wintering grounds northwest of Ely (Links 350, 351, and 352) and at the southern end of the Schell Creek Range (Link 380). Ferruginous hawk nests and long-billed curlew habitat occur on in the Steptoe Valley (Link 351, 352, and 370). From east of the Nevada-Utah state line (Link 460), this route is the same as described for the Cutoff Route.

Plants - The 230kV Corridor Route would traverse a mosaic of sage scrub for 104 miles (65 percent) and grassland communities 37 miles (23 percent). In Utah, the route would cross

approximately 14 miles (9 percent) of playa. No sensitive plant species are known to occur within the one mile of the route.

Southern Route

Wildlife - The southern route exits the Robinson Summit substation site from the south and follows the west side of the Egan Range. Ferruginous hawk nest sites are encountered along Link 340 northwest of Riepetown and at the north end of the Fortification Range on Link 420. Sage grouse leks occur at the north end of White River Valley (Link 364) and in Spring Valley (Link 420). Long-billed curlew habitat is encountered where Link 420 traverses Steptoe Valley. Other important habitats include a crucial water use area (Link 364) and critical pronghorn habitat near the Nevada-Utah state line (Link 450). From here Link 571 through 582 are the same for both the 230kV corridor and the Southern Route.

Plants - The Southern Route would traverse predominately sage scrub for approximately 154 miles (73 percent) with grassland intermingled for 27 miles (13 percent). Approximately 22 miles (11 percent) of the route would cross areas of playa.

Five species that are known to occur along the route are:

- Great Basin fishhook (Sclerocactus pubispinus) along the southern end of the Snake Range (Link 430)
- compact catseye (Cryptantha compacta), sand-loving buckwheat (Eriogonum ammophilum), and low beard tongue (Penstemon nanus) at the southern tip of the Tule Valley (Link 451)
- currant milkvetch (Astragalus uncialis) located in the Swasey Wash (Link 490)

Populations of species that occur within the one mile corridor include Great Basin fishhook, currant milk-vetch, Jones globemallow (Sphaeralcea caespitosa), limestone buckwheat (Eriogonum eremicum), Calloway milk-vetch (A. callithrix), and terrace buckwheat (E. natum).

HUMAN ENVIRONMENT

Land Use Resources

Introduction

The SWIP routing alternatives pass through a variety of landscapes and predominant land uses within the states of Idaho, Nevada, and Utah. These landscapes include:

- agriculture and range lands in the Snake River Valley of Idaho

- sage scrub and grasslands in flat to slightly rolling basins, forested mountains, and desert valleys in eastern and southern Nevada

- rugged, rocky mountain ranges and wide, flat desert basins in central Utah

Land uses encountered along routing alternatives include farms and ranches, rural residences, mines and mining claims, grazing allotments and range improvements, energy and communication facilities, transportation systems, and recreation areas. There are also a number of developed recreation facilities such as campgrounds, day use areas and picnic areas, boat launches, public and private parks. Dispersed recreation occurs through the study area, with activities such as hiking, biking, fishing, hunting, camping, sightseeing, and off-road vehicle use.

The communities of Ely and Wells, Nevada, are the only incorporated areas identified within the study corridors. Unincorporated communities and population centers identified include:

- Hansen, Hagerman, Kimberly, and Rogerson in Idaho

- Jackpot, Contact, and Currie in Nevada

- Eskdale, Abraham, and Hinckley in Utah

- rural agricultural areas, residential subdivisions, and communes

All the tables cited in this section are located at the end of the chapter. The technical report contains detailed narratives and data tables that locate and describe specific land uses along each of the alternative study corridors (refer to Appendix H for the locations where technical reports can be reviewed).

Methods

The purpose of the land use inventory was to identify, map, describe, and document the existing, planned, and designated land uses within the vicinity of the routing alternatives. Inventory data were collected within study corridors, three miles on either side of the assumed centerlines of each of the routing alternatives. The inventory data were compiled to facilitate assessing potential land use impacts from the construction, operation, and maintenance of the proposed 500kV transmission line.

Land use data were initially collected and mapped during the regional environmental study at a scale of 1:500,000 from available secondary existing sources, including maps, resource management and planning documents . Satellite imagery was used to establish landcover and verify land uses. The SWIP regional environmental study was completed in 1988 as part of public and agency scoping and identifying alternatives for the SWIP (refer to Chapters 2 and 5). Key federal, state, and local land and resource management agencies contacted

during the regional study were again contacted to inform them of the EIS studies and to obtain detailed data. Detailed data collected were compiled and mapped at a 1:100,000 scale within the study corridor. The data were digitized into Dames & Moore's GIS to facilitate analysis, the impact assessment and mitigation planning process, and documentation.

The land use resources study was divided into five major components to document surface land uses, legislative designations, and land management policies that occur within the alternative study corridors:

- land jurisdiction
- existing and planned land uses
- parks, recreation, and preservation areas
- transportation and access
- mining claims and extractive uses

Results

Land Jurisdiction - The three major categories of land jurisdiction inventoried within the alternative study corridors are listed below. The agency, owner, or other entity that owns or administrates the lands are listed under these three categories:

- Federal
  - Public land BLM
  - National Forest (Forest Service)
  - National Park Service
  - US Department of Defense withdrawals
  - Bureau of Reclamation withdrawals

- State
  - Idaho trust lands
  - Utah trust lands

- Other
  - Incorporated area (city or community)
  - Unincorporated area (county)
  - Private (county)

The mileages of BLM, Forest Service, state, and private land jurisdictions are summarized by route in Table 3-1. Also, refer to the Land Jurisdiction maps in the accompanying Map Volume. The mileage of each county crossed by each alternative route is listed in Table 3-2. In addition, refer to the technical reports for detailed land jurisdiction along each of the alternative routes (refer to Appendix H for the locations where technical reports can be reviewed).

Existing and Planned Land Uses - Some important existing land uses that occur in the study corridors include agriculture, mining, airports and airstrips, utilities, commercial,

governmental, and industrial facilities. Residential uses inventoried included all dwellings, occupied and unoccupied, within the alternative study corridors.

Residential uses were identified throughout the region, but generally occur in greater concentrations along major transportation corridors (e.g., U.S. Highway 93, Interstate 80, etc.) and in agricultural areas. Residences mixed with commercial and public uses were identified in the communities of Eden, Hagerman, and Hansen in Idaho and Jackpot, Wells, Currie, McGill, and Ely in Nevada. Trailer parks in Hinckley and other dispersed rural residences were identified near Southerland, Abraham, and Sugarville in the vicinity of Delta, Utah.

The dominant land use within the alternative study corridors is livestock grazing. The majority of public lands in Idaho, Nevada, and Utah are managed by the BLM for range uses. Throughout the region there is evidence of range management including clearing of sage scrub and piñon-juniper woodland to promote grasses, pasture and allotment fencing, seeding, and prescribed burning. In addition, there are numerous range improvements such as water distribution devices and facilities, fences, wells, water tanks and guzzlers (water collection device), corrals, and windmills. The BLM has divided range lands in the region into grazing allotments to facilitate the management of the land for public livestock grazing. The grazing allotments crossed by the alternative routes are listed in Table 4-3. Much of the private and state trust lands are also open range. In addition, viable and nonviable rangelands were interpreted using the Thematic Mapper satellite imagery. The term "viable" refers to landcover types containing vegetation types that would produce forage species for grazing. Each of the thirteen classes of landcover, from satellite mapping and data obtained in the inventory, were evaluated for their ability to provide forage vegetation. Of these classes, agriculture, lava, and playa were considered "nonviable" land covers for the production of forage vegetation.

Approximately half of the lands crossed by the alternative routes in Idaho are actively cultivated. The high desert plateau of the Snake River Valley is fertile and productive when irrigated. Typically, the potential impacts that could result from a transmission line in agriculture lands consist of conflicts with irrigation systems, and farm equipment. Center pivot, wheel line, and hand line irrigation systems are all used in southern Idaho. The majority of the agricultural lands inventoried in Idaho are classified as prime or important farmland by the SCS (refer also to Soils under Earth Resources).

Agriculture lands in Nevada are sparse and dispersed. They are typically located adjacent to perennial streams and rivers in the middle of basins and valleys or at the base of mountain ranges where natural runoff or springs provide irrigation water. Prime farmlands in Nevada inventoried within the alternative routes are located east of Jackpot near the WD Ranch, in Clover Valley in the vicinity of Wells, in Goshute Valley south of Oasis, and in Steptoe Valley north and south of Ely. Throughout the agricultural lands in Idaho and in the vicinity of Delta, Utah, herbicides and pest controls are applied by aerial crop spraying operations, seasonally.

The FAA manages the airspace in the vicinity of all air facilities (e.g., airports, registered airstrips) to control potential obstructions to aircraft operations. The land use inventory identified four types of air facilities within six miles of the assumed centerlines of the alternative study corridors:

- public airports
- private airstrips
- utility airstrips
- abandoned airstrips

Air facilities identified within the study corridors in Idaho include a private utility airstrip southwest of Hagerman, Idaho (Link 64), and several unimproved airstrips (fields) used by aerial spraying operations. There is a private airstrip located west of Caliente, Nevada, at the southern end of Delamar Valley (Link 671) within one mile of the assumed centerline. Another private airstrip was identified in the Delamar Lake bed in the southern portion of Delamar Valley (Link 690).

There is a linear graveled area overgrown with sage adjacent to Interstate 80 just southeast of Oasis, Nevada (Link 223), that appears to be an abandoned airstrip. However, the Elko District of the BLM has no record of this area being used as an airstrip. A similar linear feature was identified northwest of Riepetown, Nevada (Link 300). This feature is indicated as "landing strip" on the USGS Mount Hamilton 1:100,000-scale metric series topographic map. However, according to the Ely District of the BLM, this area is used to stockpile highway paving materials.

The U.S. Air Force manages several large areas of airspace within the study corridors as military operating areas (MOAs) or Restricted Area (air space) used by military aircraft for flight and tactical training operations. Several of the Ely to Delta alternative routes would cross lands within MOAs in the Utah Testing and Training Range (UTTR) operated by Hill Air Force base (AFB) in west-central Utah. The above-ground-limit (AGL) varies in the UTTR. The AGL for the Restricted Area R-6405 (a portion of Links 610 and 630) is 100 feet, the Gandy MOA and Sevier A and B MOAs (Link numbers 222, 224, 226, 262, 461, 462, 451, 408, 470, 490, 590, 572, 580, 530, 520, 510, 550, 600, 571, 600, 630, 640, and 650) all have an AGL of 200 feet.

Nellis AFB in southern Nevada operates several MOAs that would be crossed by Midpoint to Dry Lake alternative routes including: Reveille MOA (Links 670, 671, 672, 673 and 674), Caliente MOA (Links 671, 673, 674, 675, 680 and 690), Elgin North MOA (Link 680) and Sally Corridor MOA (Links 680, 690 and 700). All of these MOAs have an AGL of 200 feet.

Linear Features - Linear facilities found within the study corridors in Idaho consist of existing electrical transmission lines, numerous sub-transmission lines and distribution lines, irrigation canals, roads and highways (also refer to Transportation and Access section), and other utility features. Idaho Power Company (IPCo) owns and operates two 230kV transmission lines and four 138kV transmission lines that would be crossed by Links 61 and 64. The IPCo Midpoint to Valmy 345kV transmission line is paralleled by Links 40, 50, 70, 72, 101, 102, 110, and 130. Links 70, 72, 101, 715, 110, and 130 also parallel the IPCo Upper Salmon to Wells 138kV transmission line. Three gas pipelines (Link 64) and two oil pipelines operated by Northwest Gas Company and Chevron (Links 41 and 64) would also be crossed.

In Nevada, linear facilities include a 69kV transmission line that cross the toe of the Schell Creek Range between Ely and Lages Station, a 230kV transmission line from Ely to Robinson Summit (Link 350), and two 230kV transmission lines that traverse the eastern edge of

Steptoe Valley (Link 370) and the Schell Creek Range just north of Connors Pass (Link 380). At the southern end of Dry Lake Valley, a 69kV transmission line traverses the toe of the Burnt Springs Range from Black Canyon south into Delamar Valley and then parallel to Pahranagat Wash (Links 675, 690, 700).

In Utah, the Intermountain Generating Station is located north of Delta (Links 581 and 582). The IPP to Adelanto 500kV DC transmission line crosses from this power plant southeast of Delta. The Gondor to IPP 230kV transmission line is joined by the Gondor to Pavant 230kV transmission line just west of Marjum Pass. The two lines run parallel from this point to the Gondor Substation north of Ely, Nevada.

Parks, Recreation, and Preservation - The land use study also identified parks, recreation and preservation lands managed by federal, state, or local agencies, including national parks, national monuments, and state and local parks. The inventory also includes privately owned recreational sites and facilities.

In addition, other special management areas on public lands such as Wilderness areas, wilderness study areas (WSA), natural areas (NA), areas of critical environmental concern (ACEC), scenic areas (SA), and special recreation management areas (SRMA) were inventoried. Specific recreation sites included campgrounds, day-use areas and picnic areas, off-road vehicle use areas, trails and trailheads, boat launches, roadside rest areas, and other facilities.

WSAs are established under Section 603 of the Federal Lands Policy and Management Act (FLPMA) of 1976. The BLM manages these lands to protect unique natural resources and values under the Interim Management Guidelines. These regulations apply only to lands within the boundaries of WSAs and will be in effect until Congress designates these lands as Wilderness or recommends that they be returned to multiple use.

The Lower Salmon Falls Creek WSA was the only WSA identified within the study corridors in Idaho. The recently designated Mount Moriah Wilderness in Nevada was the only Wilderness area identified within a study corridors. A total of fourteen WSAs were identified within the study corridors in Nevada, including portions of South Pequop, Bluebell, Goshute Peak, Goshute Canyon, Marble Canyon, Mount Grafton, Fortification Range, Delamar Mountains, Evergreen, Meadow Valley Mountains, Fish and Wildlife 1, 2, & 3, and Arrow Canyon. Six WSAs were inventoried within the study corridors in Utah including Howell Peak, King Top, Notch Peak, Fish Springs, and Swasey Mountain. Table 3-3 lists the mileage that each of the alternative routes would be adjacent or parallel to WSA boundaries (e.g., 0-1/4 mile, 1/4-1 mile)

Parks and recreation uses in Idaho include the Minidoka Relocation Center Interpretive site (Links 20), the Oregon Trail (Links 41, 61, 64), the Hagerman Fossil Beds National Monument (Links 63, 64), the Snake River Rim Recreation Area (Links 41, 61), and the Salmon Falls Creek Reservoir SRMA (Links 50, 64, 70,).

Parks and recreation uses within the study corridors in Nevada include the California National Study Trail (Links 140 and 151), the California Trail Scenic Back Country Byway (Link 82, 83, 140, and 151) and the Pony Express Trail (Links 263, 264, and 270). Additional

areas include the Salmon Falls Creek SRMA (Links 711, 72), the proposed Kane Springs Back Country Byway (Link 680), and proposed Horse and Cattle Camp Back Country Byway (Link 364). Great Basin National Park is located just outside the study corridor near the Nevada-Utah state line (Link 460).

Transportation and Access - In Idaho, alternative routes would cross and/or parallel Interstate 84, U.S. Highway 93, and portions of U.S. Highways 25, 30, and 50. Highways that would be crossed by alternative routes within the study corridors in Nevada include Interstate 80 between Wells and Wendover, U.S. Highway 6/50 between Ely and the Nevada Utah state line, and U.S. Highway 6 between Ely and Currant, Nevada. U.S. Highway 93 would be paralleled and crossed by several alternative routes from the Idaho-Nevada state line south to Wells. U.S. Highway 6/50 and Utah State Highway 21 are the only highways that would be crossed by the study corridors in Utah.

Paved and unpaved "section" roads grid agriculture areas throughout the alternative study corridors in Idaho. Public lands south of the agriculture areas near the Nevada-Idaho state line contain numerous unimproved roads. In Nevada, both public and private lands are connected to the highway system by a vast network of unpaved roads. Numerous improved and unimproved roads were inventoried traversing the basin areas in Nevada and Utah. In mountainous areas, four-wheel drive trails and miners' roads wind along many of the slopes and drainages.

The Union Pacific Railroad in Idaho would be crossed one time by Links 20, 30, 41 on the Snake River plateau and once more north of the Nevada-Idaho state line (Link 50). The Nevada Northern Railroad would be paralleled by several alternative routes. The portion of the Nevada Northern Railroad between Ely and McGill, Nevada (Link 370), is used by historic steam engine train excursions.

Mining Claims and Extractive Uses - The only extractive land uses within the study corridors in Idaho are several sand and gravel operations and a pumice mining operation in the foothills outside the Sawtooth National Forest (Link 41). Only two active mining claims were identified in the study corridors in Idaho. The total mileage of mining claims crossed by each route are shown in Tables 2-4 and 2-5.

Mining is an important land use in Nevada. There are numerous mines dispersed throughout the mountainous areas of the state. Mines in the vicinity of the alternatives occur in the foothills of the Schell Creek Range at the edge of the Steptoe Valley, and in Cooper Canyon southeast of Ely. The Robinson Project, formerly the Kennecott copper pit, is a large mine west of Ely located outside the study corridors.

The Crystal Queen Mine, an active mining operation, is located in Dry Gulch at the edge of Spring Valley. Mine facilities adjacent to U.S. Highway 6/50 are over two miles from the nearest route segment(Link 400). Mining operations and exploration sites were also identified in Utah in the Drum Mountains (Links 630, 640), northwest of Delta.

Public lands in mountainous areas in Nevada and Utah have been staked with numerous, and often overlapping, mining claims. Further, the trend in mining methods in the 1980s has resulted in the staking of many new mining claims on lands in the alluvial areas of the open

basins and valleys. All of the alternative routes would cross active mining claims. Some of the most recent mining claims were identified on the Humboldt National Forest along the northern boundary of Great Basin National Park in the Osceola area and along the edges of the north end of Spring Valley (Links 262, 264, 265, and 266).

The BLM will conduct a search of the public records to identify those unpatented mining claims that SWIP may ultimately cross prior to the issuance of the right-of-way grant for both pre- and post-1955 claims (P.L. 167, 69 Stat. 30 USC 612).

Alternative Routes - Midpoint to Dry Lake

Route A

Between Midpoint Substation to Jackpot, Nevada, Route A would cross primarily sage and grass covered range lands parallel to the Midpoint to Valmy 345kV and the Midpoint to Hunt 230kV transmission lines (Link 10). The route would turn south and pass adjacent to the Minidoka Relocation Center Historic Site and a stockyard/feedlot in the vicinity of the community of Eden (Link 20). From a small substation near Hunt, the route would continue south parallel to the 345kV transmission line traversing agricultural lands and crossing over the Snake River Canyon (Link 41). Route A would cross the Oregon Trail (Link 41) southwest of Murtaugh. Southeast of Twin Falls, the route would turn west along the edge of the foothills crossing mixed agricultural lands and sage/grass covered range. It would then cross U.S. Highway 93 south of Rogerson (Link 50) and traverse the Salmon Falls Creek Reservoir SRMA, located west of Browns Bench (Link 70).

From Jackpot, Nevada, the route would cross through the Salmon Falls Creek SRMA (Link 72) parallel to the Midpoint to Valmy 345kV and the Upper Salmon to Wells 138kV transmission lines, roughly parallel to U.S. Highway 93. Continuing south paralleling these lines and the highway (Links 101, 101), the route would pass just east of the community of Contact (Link 110). Further south, near HD Summit, the route would turn sharply east across U.S. Highway 93 (Link 1612). Then adjacent to West Bush Creek, the route would cross the California National Study Trail (Link 1612). In Toano Draw, the route would cross the Union Pacific Railroad northwest of Oasis.

From Oasis, Route A would cross Interstate 80 passing east of a ranch at the toe of the Pequop Mountains (Link 211), and begin to parallel the Nevada Northern Railroad at Shafter (Link 212). The route would continue south along the railroad through sage scrub range lands and would pass within one mile of the South Pequop WSA in the Goshute Valley (Link 230). Southwest of Dolly Varden, the route would turn south through the Currie Hills to cross U.S. Highway 93 Alternate (Link 250) just north of Lages Station. The route would parallel this highway (Link 259) along the western toe of the Schell Creek Range and would then cross the highway again to access the North Steptoe substation site (Link 260).

From the proposed North Steptoe substation site, Route A would cross sage scrub range lands in the Steptoe Valley and cross the Egan Range through Dry Canyon (Links 291, 293). Just south of Cherry Creek Station, the route would cross the Pony Express Trail (Link 291).

The route would cross U.S. Highway 50 just before reaching the Robinson Summit substation site (Link 310). Continuing south, the route would cross U.S. Highway 6, passing through sparse grass-covered range lands in Jakes Valley and the White River Valley (Links 669, 670). The route would pass around the southern end of the Wayne Kirch Wildlife Management Area. Here the route crosses through several military operating areas (MOAs) in Dry Lake Valley, Delamar Valley, and Coyote Spring Valley. Nellis AFB conducts flight training and low-level operations in the Reveille MOA (Links 670, 671, 672), the Caliente MOA (Links 671, 673, 675, 690), and the Sally Corridor MOA (Links 690, 700). Approximately 130 miles of Route A would cross MOAs in Nevada.

Continuing south through range lands in Dry Lake Valley, the route would begin to parallel a 69kV transmission line, before crossing U.S. Highway 93, a designated scenic highway, at the southern end of the valley. Near the highway crossing, the route would pass several miles east of a private airstrip (Link 675). The route would pass within a mile of a utility airstrip in Delamar Lake located at the southern end of Dry Lake Valley (Link 690). Just east of Maynard Lake, the route would parallel U.S. Highway 93 through sparse range in Pahranagat Wash through a narrow area between the Delamar Mountains WSA (Link 690) and the Evergreen WSA. Route A would use a designated utility corridor through the west edge of the Aerojet Land Exchange area in Coyote Spring Valley parallel to U.S. Highway 93. This route would pass between the Fish and Wildlife 1, 2, & 3 WSAs (Link 700) in the Sheep Creek Range that bound the Desert National Refuge and the Arrow Canyon WSA (Link 700) northeast of Las Vegas. In Hidden Valley, the route would turn east through a pass at the southern end of the Arrow Canyon Range to reach the Dry Lake substation site.

Approximately 79 percent of the lands that would be crossed by Route A are administered by the BLM. Of the lands remaining, about 20 percent are private land and about 1 percent are state-administered lands. No Forest Service lands would be crossed by this route.

The predominant land use along this route is range, over 490 miles of range are crossed. Approximately 21 miles of this route would cross irrigated prime and unique farmlands located primarily in Idaho between the Midpoint Substation and the Idaho-Nevada state line. In addition, there are approximately 17 miles of other cultivated lands that would be crossed.

Route A would cross approximately 33 miles of mining claims, primarily located in Nevada. The route would parallel approximately 55 miles of H-frame 69kV transmission line and about 96 miles of 345kV transmission line (Midpoint to Valmy).

Route B

Route B is the same as Route A between Midpoint Substation and Jackpot, Nevada.

South of Jackpot, Route B would cross U.S. Highway 93 and pass through grass and sage range lands in Trout Creek (Links 91, 92). In Thousand Springs Valley, the route would cross the California National Study Trail (Link 140) and the California Trail Scenic Back

Country Byway. The route would cross the Southern Pacific Railroad at southern end of Toano Draw, and then would cross Nevada State Highway 233 (Link 221) in the vicinity of Oasis, Nevada.

From Oasis to Silver Zone Pass (Link 222) Route B would parallel Interstate 80 a few miles north of the highway. The route would then cross the highway in the pass before continuing south along the eastern toe of the Goshute Mountains through sparse range lands. West and south of Wendover, the route would pass near the Bluebell WSA (Link 222) and the Goshute Peak WSA (Links 222, 224, 226). Also in this area, the route would pass through portions of two military operating areas (MOA). The Lucin A and Gandy MOAs (Links 222) are part of the Utah Testing and Training Range (UTTR) operated by Hill AFB for low-level flight operations.

Near Ferguson Mountain, the route would cross U.S. Highway 93 (Link 224) and pass adjacent to the boundary of the Goshute Peak WSA (Link 226). Roughly parallel and several miles south of this highway, Route B would continue southeast (Link 226) through sparse range lands to the northern end of the Schell Creek Range near Lages Station, Nevada, where this route would cross U.S. Highway 93 into the North Steptoe substation site (Link 260).

From the North Steptoe substation site to the Robinson Summit substation site, Route B would cross the Pony Express Trail southwest of Cherry Creek Station (Link 280) in the Steptoe Valley, where this route would then parallel the Nevada Northern Railroad for a short distance, before turning west through Antone Pass. The route would cross high valley range lands in Butte Valley south to the Robinson Summit substation site.

Route B is the same as Route A from the Robinson Summit substation site to the Dry Lake substation site, northeast of Las Vegas.

Approximately 78 percent of the lands that would be crossed by Route B are administered by the BLM. Of the lands remaining, about 21 percent are private land and about 1 percent are state-administered lands. No Forest Service lands would be crossed by this route.

Range is the predominant land use along this route. The route would cross approximately 493 miles of range land. Approximately 21 miles of this route would cross irrigated prime and unique farmlands. These lands are primarily located in Idaho between the Midpoint Substation and the Idaho-Nevada state line. In addition, there are approximately 17 miles of other cultivated lands that would be crossed.

Route B would cross approximately 47 miles of mining claims, mainly in Nevada. Approximately 55 miles of this route would parallel H-frame 69kV transmission line and about 73 miles would parallel 345kV transmission line.

Route C

Route C is the same as Route B between Midpoint Substation to the vicinity of Oasis, Nevada (Link 200). From Oasis to the proposed Dry Lake substation site, Route C is the same as Route A.

Approximately 76 percent of the lands that would be crossed by Route C are administered by the BLM. Of the lands remaining, about 23 percent are private land and about 1 percent are state-administered lands. No Forest Service lands would be crossed by this route.

Range uses are the predominant land use along this route. Route C would cross approximately 486 miles of range land. The route would cross approximately 21 miles of irrigated prime and unique farmlands, mainly in Idaho between the Midpoint Substation and the Idaho-Nevada state line. In addition, there are approximately 17 miles of other cultivated lands that would be crossed.

The route would cross approximately 37 miles of mining claims. The majority of these claims are located in Nevada. Approximately 55 miles of this alternative route would parallel H-frame 69kV transmission line and about 73 miles would parallel 345kV transmission line.

Route D

From Midpoint Substation to Jackpot, Nevada, Route D is the same as Route A. In addition, this route is also the same as Route A to just north of HD Summit (Link 162).

From HD Summit, Route D would continue south parallel to the Upper Salmon to Wells 138kV transmission line through sage grassland range along Bishop Creek (Links 1611, 166, 167). The route would cross the California National Study Trail adjacent to Flats Creek (Links 167). Just west of Wells Peak, the route would cross U.S. Highway 93 and would pass through range lands in the Town Creek Flats (Links 1613, 170) before crossing Interstate 80 west of Wells, Nevada.

South of the interstate, the route would traverse the western toe of the Wood Hills (Link 180) and would parallel the Union Pacific Railroad southeast across Independence Valley, where the route would cross another segment of the California National Study Trail (Link 190). At the Pequop Mountains, the route would cross into the Goshute Valley passing near the South Pequop WSA (Link 190) to parallel the Nevada Northern Railroad (Link 230). The route would continue south parallel to the railroad, then turn south to pass approximately three miles east of Currie, Nevada. Southeast of this community, the route would cross U.S. Highway 93 into the Steptoe Valley on the west side of Goshute Lake. Along the western edge of Steptoe Valley, Route D would pass adjacent to the Goshute Canyon Recreation Area at the eastern tip of the Goshute Canyon Natural Area which is within the Goshute Canyon WSA (Link 241). In addition, this route would pass near the Goshute Canyon WSA. At the base of the Cherry Creek Range before the route reaches the North Steptoe substation site, Route D would pass near several ranches.

From the proposed North Steptoe substation site to the proposed Dry Lake substation site, Route D is the same as Route A.

Approximately 78 percent of the lands that would be crossed by Route D are administered by the BLM. Of the lands remaining, about 21 percent are private land and about 1 percent are state-administered lands. No Forest Service lands would be crossed by this route.

Range uses are the predominant land use along this route. The route would cross approximately 492 miles of range land. Approximately 21 miles of this route would cross irrigated prime and unique farmlands located, primarily in Idaho between the Midpoint Substation and the Idaho-Nevada state line. In addition, there are approximately 17 miles of other cultivated lands that would be crossed.

Route D would cross approximately 40 miles of mining claims, mainly in Nevada. Approximately 55 miles of this alternative route would parallel H-frame 69kV transmission line and about 80 miles would parallel 345kV transmission line.

Route E

From Midpoint Substation to the vicinity of Oasis, Nevada (Link 200), Route E is the same as Route A. Then, from Oasis to the proposed North Steptoe substation site, Route E is the same as Route B.

From the proposed North Steptoe substation site to the proposed Robinson Summit substation site, Route B would cross the Pony Express Trail southwest of Cherry Creek Station (Link 280) in Steptoe Valley and would parallel the Nevada Northern Railroad for a short distance before turning west through Antone Pass. The route would then continue through high valley range lands in Butte Valley south to the Robinson Summit substation site.

Route E is the same as Route A from the Robinson Summit substation site to the proposed Dry Lake substation site, northeast of Las Vegas.

Approximately 81 percent of the lands that would be crossed by Route E are administered by the BLM. Of the lands remaining, about 18 percent are private land and about 1 percent are state-administered lands. No Forest Service lands would be crossed by this route.

Range uses are the predominant land use along this route, crossing approximately 502 miles. Approximately 21 miles of this route would cross irrigated prime and unique farmlands. These lands are primarily located in Idaho between the Midpoint Substation and the Idaho-Nevada state line. In addition, there are approximately 17 miles of other cultivated lands that would be crossed.

Route E would cross approximately 40 miles of mining claims, mainly in Nevada. Approximately 55 miles of this alternative route would parallel H-frame 69kV transmission line and about 96 miles would parallel 345kV transmission line.

Route F

Route F would depart Midpoint Substation to the west toward the Hagerman area crossing rural agricultural lands broken by dispersed sage scrub range (Link 61) parallel to the Midpoint to Malin 500kV and the Midpoint to Boise Bench 230kV transmission lines. The route would pass near rural residences and cross agricultural lands in the Snake River Valley. There are several residences on the bluff above and in the Hagerman area adjacent to the this route. The route would cross the Snake River (Link 61) just south of Malad Gorge State Park. On the west side of the Snake River, the route would parallel the north and west boundaries of the recently designated Hagerman Fossil Beds National Monument (Links 62, 64).

The route would turn south (Link 64) across a long, narrow strip of BLM lands known as Dickey Bird Lane. This area is used for wildlife research by BLM and the Idaho Fish and Game Department. From the end of Dickey Bird Lane, the route would traverse adjacent to a utility airstrip used by aerial spraying operations located near the southern boundary of the Hagerman Fossil Beds National Monument and would cross rural agricultural lands passing near several rural residences.

About a mile northeast of Balanced Rock State Park, the route would cross Salmon Falls Creek Canyon, north of the portion designated as an area of critical environmental concern (ACEC), parallel to the Upper Salmon to Wells 138kV transmission line (Link 64). The route would continue south parallel to this transmission line roughly paralleling the western rim of the Salmon Falls Creek Canyon. East of Browns Bench, the route would pass through sage grassland range in the Salmon Falls Reservoir SRMA to the Idaho-Nevada state line near Jackpot, Nevada (Link 70).

Route F is the same as Route B from just south of Jackpot to near Oasis, Nevada. Then, from Oasis to the proposed Dry Lake substation site, Route F is identical to Route A.

Approximately 77 percent of the lands that would be crossed by Route F are administered by the BLM. Of the lands remaining, about 23 percent are private land and about 1 percent are state-administered lands. No Forest Service lands would be crossed by this route.

Range uses are the predominant land use along this route. The route would cross approximately 507 miles of range land. Route F would cross approximately 32 miles of irrigated prime and unique farmlands, mainly in Idaho between the Midpoint Substation and the Idaho-Nevada state line. In addition, there are approximately 22 miles of other cultivated lands that would be crossed.

Route F would cross approximately 30 miles of mining claims. These claims are primarily located in Nevada. Approximately 55 miles of this alternative route would parallel H-frame 69kV transmission line, about 33 miles would parallel guyed-steel 345kV transmission line and approximately 25 miles would parallel H-frame 230kV and steel lattice 500kV transmission lines.

Route G

Route G is the same as Routes A from Midpoint Substation south to Jackpot, Nevada, to the Idaho-Nevada state line (Link 70).

West of Jackpot, the route would cross Salmon Falls Creek (Link 711) a mile west of the Upper Salmon to Wells 138kV transmission line crossing. This route would be the third transmission line crossing in an area managed as the Salmon Falls Creek SRMA. Route G would then turn southwest (Link 714) to parallel the Midpoint to Valmy 345kV transmission line south along the west side of the Upper Salmon to Wells 138kV transmission line (Link 101, 715) through sage grassland range, parallel to the west U.S. Highway 93. Just north of Contact, Nevada, the route would turn sharply east across U.S. Highway 93 passing adjacent to several residences (Link 713) and then would turn sharply south. The route would continue south paralleling these two transmission lines on the east side to Rocky Peak (Links 110, 130). Route G would turn southeast away from the existing transmission line corridor before crossing the California National Study Trail (Link 151) in Thousand Springs Valley. The route would cross the California Trail Scenic Back Country Byway near the Winecup Ranch (Link 151).

The route would traverse sage scrub range lands along the western edge of the Toano Draw (Link 200) into Goshute Valley. Passing to the west of Oasis, Nevada, the route would cross Interstate 80 (Link 211) and traverse sage scrub range lands near several ranches at the base of the Pequop Mountains in the Goshute Valley. The route would continue south through the Goshute Valley (Links 212, 230) parallel to the Nevada Northern Railroad past Shafter and Dolly Varden. A little south of Mizpah, the route would turn south away from the railroad to cross U.S. Highway 93 several miles southeast of Currie, Nevada (Link 241). Continuing south along the western edge of Goshute Lake, the route would turn southeast into the North Steptoe substation site.

Route G is the same as Routes B from the North Steptoe substation site to the Dry Lake substation site northeast of Las Vegas, Nevada.

Approximately 79 percent of the lands that would be crossed by Route G are administered by the BLM. Of the lands remaining, about 18 percent are private land and about 1 percent are state-administered lands. No Forest Service lands would be crossed by this route.

Range uses are the predominant land use along this route. Route G would cross approximately 473 miles of range land. The route would cross approximately 21 miles of irrigated prime and unique farmlands. These lands are primarily located in Idaho between the Midpoint Substation and the Idaho-Nevada state line. In addition, there are approximately 17 miles of other cultivated lands that would be crossed.

Route G would cross approximately 28 miles of mining claims, mainly in Nevada. Approximately 55 miles of this alternative route would parallel H-frame 69kV transmission line and about 96 miles would parallel 345kV transmission line.

Alternative Routes - Ely To Delta

Direct Route

The Direct Route would interconnect with the Midpoint to Dry Lake portion of the SWIP at the proposed North Steptoe substation site. From this substation site, the route would cross over the north end of the Schell Creek Range to the east through the Dry Canyon into Spring Valley (Links 262, 263). The route would cross the Pony Express Trail in Spring Valley (Link 265) and continue through sage scrub range lands to the southeast, passing Twelvemile Summit, Red Hills, Mike Springs Wash, and just north of the Little Hills (Link 266).

The route then would turn east passing to the north of Tin Springs Mountain (Link 620), and would continue east paralleling the Juab-Millard county line in Utah (Link 630). The route would cross into Snake Valley at the south end of the Deep Creek Range.

The route would pass through an MOA, part of the UTTR where Hill AFB conducts flight training low-level flight operations. The route would pass through the Gandy MOA (Link 620) in Spring Valley. From approximately the Nevada-Utah state line to east of the Confusion Range, the route would be within the R-6045 Restricted Area, a controlled military airspace. The route would continue east crossing through the Confusion Range and into Tule Valley south of the Middle Range through sparse range lands passing near the southern end of the Fish Springs WSA (Link 630).

The route would pass through the Sevier A and B MOAs (Link 630) beyond the House Range near Swasey Point and the Swasey Mountain WSA, and then would turn southeast between the Drum Mountains and Little Drum Mountains (Link 640). The route would turn due east to pass south of the Drum Mountains and just north of Greener Reservoir. For approximately the last twelve miles into the proposed Intermountain substation site, the route would parallel the IPP to Adelanto 500kV DC transmission line to the north of rural agricultural lands in the vicinity of Delta, Utah (Links 572, 580, 581, 582).

Approximately 95 percent of the lands that would be crossed by this route are administered by the BLM. Of the lands remaining, about 5 percent are state-administered lands. No Forest Service or private lands would be crossed by this route.

The predominant land use along this route is range, over 135 miles of range use crossed. This route would not cross irrigated prime and unique farmlands or cultivated lands.

This route would cross approximately 7.8 miles of mining claims, primarily located in Nevada. The route would parallel approximately 11.5 miles of H-frame 230kV transmission line and about 12.8 miles of 500kV transmission line.

Cutoff Route

The first segment of the Cutoff Route from the North Steptoe substation site to just east of the Little Hills is the same as the Direct Route, described above. From the Little Hills, the route would cross to the northeast side of Government Peak through sage scrub range lands in the Little Valley. In Little Valley, the route would pass through the Gandy MOA and pass within one mile to the east of the Mount Moriah Wilderness and Marble Canyon WSA. This route would pass through the southwestern corner of the R-6045 Restricted Area (Link 267), a controlled military flight training area operated by Hill AFB for a short distance.

The route would traverse southeast across Snake Valley and through Coyote Pass in the Conger Range, within the Sevier A and B MOAs (Link 268). The route would remain within these MOAs to just west of the Delta area. North of the Buckskin Hills, the route would begin to parallel Gondor to Pavant 230kV and the Gondor to IPP (IPA) 230kV transmission lines east through Sheepmens Little Valley and Payson Canyon (Link 462). Continuing east parallel to these lines, the route would cross Tule Valley and pass through Marjum Canyon (Link 462) between the Howell Peak WSA and the Notch Peak WSA.

The two 230kV transmission lines diverge east of Marjum Canyon. The Cutoff Route would follow the IPA 230kV line northeast across the Whirlwind Valley passing near the Swasey Mountain WSA (Link 470) to the south end of the Little Drum Mountains where the 230kV line is joined by the IPP to Adelanto 500kV DC transmission line (Links 571, 572, 580, 581, 582). The route would parallel these two transmission lines into the Intermountain Generating Station.

Approximately 93 percent of the lands that would be crossed by this route are administered by the BLM. Of the lands remaining, about 7 percent are state-administered lands. No Forest Service or private lands would be crossed by this route.

The predominant land use along this route is range, with over 153 miles crossed. This route would not cross irrigated prime and unique farmlands or cultivated lands.

This route would cross approximately 7 miles of mining claims, primarily located in Nevada. The route would parallel approximately 72 miles of H-frame 230kV transmission line and about 20 miles of 500kV transmission line.

230kV Corridor Route

This route would originate at the Robinson Summit substation site and traverse east into Smith Valley (Link 350) parallel to the Gondor to Machacek 230kV transmission line. In Smith Valley, the route would pass south of the Ely Maximum Security Prison and several rural residences. The route would continue east parallel to the 230kV transmission line south of Hercules Gap into Steptoe Valley passing north of a rural subdivision. At the Gondor Substation, northeast of Ely, the route would cross U.S. Highway 93 (Link 370) and begin to parallel two of the Gondor to Pavant 230kV and Gondor to IPP 230kV transmission lines. The route would traverse the eastern edge of the Steptoe Valley east of Ely. Before entering

the Humboldt National Forest through Cooper Canyon (Link 380), the route would pass adjacent to mining operations in the foothills of the Schell Creek Range.

Continuing parallel to the 230kV transmission lines, the route would cross east along Spring Creek and would cross the Snake Range through Weaver Creek adjacent to a proposed BLM primitive camping area (Link 460). The 230kV Corridor Route would pass to the north of Great Basin National Park and the surrounding portion of the Humboldt National Forest in Sacramento Pass (Link 460). The route would cross sage scrub range lands and U.S. Highway 6/50 twice in the Snake Valley. At the east side of the Snake Valley, the route would traverse to the south of Eskdale and into the Buckskin Hills.

From north of the Buckskin Hills to the Intermountain substation site, this route is the same as described for the Cutoff Route above.

Approximately 82 percent of the lands that would be crossed by this route are administered by the BLM. Of the lands remaining, about 8 percent are private land and about 5 percent are state-administered lands and 5 percent Forest Service lands.

The predominant land use along this route is range, with over 152 miles crossed. Approximately 1.2 miles of this route would cross irrigated prime and unique farmlands. In addition, there are approximately 2 miles of other cultivated lands that would be crossed.

This would cross approximately 29 miles of mining claims, primarily located in Nevada. The route would parallel approximately 34 miles of H-frame 69kV transmission line, about 160 miles of 230 transmission line and about 20 miles of 500kV transmission line.

Southern Route

The route would originate from the Robinson Summit substation site and head south along the east side of the Jakes Valley (Link 340). Then south of Duck Peak, the route would cross the White River Valley (Links 362, 364). The route would cross the Egan Range through Water Canyon and into Williams Creek passing south of the Ward Charcoal Ovens State Park (Link 364). At the southern end of the Steptoe Valley, the route would cross Cattle Camp Wash, and pass to the north of Cattle Camp Spring. The route would cross the proposed Horse and Cattle Camp Back Country Byway (Link 364) twice near the northern boundary of the Mt. Grafton WSA (Link 364). North of Lake Valley Summit in the Steptoe Valley, the route would cross U.S. Highway 93 (Link 420), a portion of designated scenic highway, and would pass near a site proposed in the Great Basin National Park Draft General Management Plan (GMP) for a wayside station.

After the highway crossing, the route would cross southeast across sage scrub range lands in Spring Valley to the north of the Fortification Range (Link 420). The route would then turn east around the southern end of the Snake Range. In Antelope Valley Wash, the route would cross Nevada State Highway 21 (Link 451) near a site proposed in the Great Basin National Park Draft GMP for a wayside station and pass to the north of the Mormon Gap Reservoir. Then northeast through Cowboy Pass, the route would cross the Ferguson Desert to Snake

Pass north of the Wah Wah Mountains WSA (Link 451). Passing around the southern tip of the King Top WSA (Link 451), the route would then turn sharply north into the Tule Valley, just south of the Barn Hills. The route would turn northeast near Skull Pass and would cross the Sevier Desert north of Sevier Lake before joining the IPP to Adelanto 500kV DC transmission line to the Intermountain substation site (Links 490, 510, 560, 571, 572, 572, 580, 581, 582). The route would pass through rural agricultural lands near Hinckley, Abraham, and Sugarville parallel to the existing transmission lines.

Approximately 94 percent of the lands that would be crossed by this route are administered by the BLM. Of the lands remaining, about 1 percent are private land and about 5 percent are state-administered lands. No Forest Service lands would be crossed by this route.

The predominant land use along this route is range, with 211 miles crossed. This route would not cross irrigated prime and unique farmlands. In addition, there are approximately 0.1 miles of other cultivated lands that would be crossed.

This would cross approximately 2 miles of mining claims, primarily located in Nevada. The route would parallel approximately 18 miles of H-frame 230kV transmission line and about 31 miles of 530kV transmission line.

Visual Resources

Introduction

The landscapes of the study area fall into the Columbia Plateau and Basin and Range physiographic provinces. Both provinces are characterized by relatively open, uninterrupted views and minimal overstory vegetation cover.

Northern portions of the study area, within southern Idaho and northeastern Nevada, are in the Snake River Plain section of the Columbia Plateau physiographic province. This section is a vast, relatively flat plain and young lava plateau, which is deeply dissected by the canyons of the Snake River and Salmon Falls Creek, the dominant landscape features within this area. The Snake River Plateau is bounded on the southwest by the South Hills. Irrigated agricultural lands, this area's main land use, are found clustered on the plateau north and south along the Snake River Canyon.

South on the Snake River Plain, agricultural areas extend to the bordering foothills and mountains in a transitional landscape between the Basin and Range and Columbia Plateau provinces. This transitional landscape includes foothills, plateaus, mesas, and buttes formed of eroded lava and sedimentary rock layers.

The majority of the study area, including northeastern and southern Nevada and western Utah, falls within the Basin and Range physiographic provinces. Topographically, this landscape is distinguished by isolated, roughly parallel mountain ranges separated by closed (undrained) desert basins or playas. The mountain ranges often run 50 to 75 miles in length

and are generally north-south trending. Surrounding the base of the mountains and extending into the basins, there are often distinctive alluvial areas.

Portions of the study area in western Utah also include a transition zone of the Basin and Range province into what is locally referred to as the "West Desert" landscape. This landscape includes portions of the Sevier Desert and Sevier Lake. The topography within this area is extremely flat and includes large playas or mud flat areas, that exhibit little landform diversity. Again, these areas are divided by rugged, rocky mountain ranges.

Methods

The visual resource study addresses the importance of the inherent aesthetics of the landscape, the public value of viewing the natural landscape, and the contrast or change to the landscape from the proposed SWIP 500kV transmission line.

A majority of the lands within the alternative routes are administered by the BLM, and to a lesser degree, the FS, and private, state, and military withdrawals. The current BLM 8400 series Visual Resource Management (VRM) Manual and the FS Visual Management System (VMS) formed the basis for developing a consistent methodology for the visual resource inventory, and to assess visual impacts of the SWIP alternatives. The VRM classes for BLM-administered lands and Visual Quality Objectives (VQOs) for National Forest System lands establish the guidelines for the level of acceptable visual change allowed in the landscape. There are no formal guidelines for managing visual resources on state or private lands.

VRM and VQO data were collected and mapped, where available, for a six-mile wide corridor along the SWIP alternatives. The level of visual resource data available for the study area from agency data sets varied in study scales and level of detail. Also, visual management classifications varied somewhat at jurisdictional boundaries between agencies, resources areas, and/or districts.

In designating visual management classes, the BLM and FS use a process that considers scenic quality (or visual quality for the FS), visual sensitivity of viewers, and visibility from sensitive viewpoints. In portions of the Egan Resource Area of the BLM's Ely District and the Stateline Resource Area of the BLM's Las Vegas District, VRM inventories have not yet been completed. In this area, it was necessary to derive project-level VRM classes to achieve a consistent inventory for analysis and impact assessment. To do this, computerized analytical models, developed on a GIS, were used to determine project visibility and other study components for the SWIP, based on the inventory and analysis procedures in BLM's 8400 series VRM manual.

Data gathered during the inventory were supplemented with other mapped and derived data included mapping of existing transmission lines and corridors, visibility from sensitive viewpoints, scenic quality, and visual contrast levels. The impact assessment models used these data to determine the potential impacts to scenic quality and sensitive viewers, and to determine compliance or noncompliance with agency management objectives (refer to Chapter 4).

Landscape character types are homogenous landscape units refined from the regional physiographic classifications. Landscape character types typically define dominant landforms and features (e.g., mountains, canyons). Each landscape character type was further divided into smaller units with similar visual characteristics. These homogeneous landscape units or scenic quality rating units were evaluated for scenic quality using BLM and FS criteria.

The locations and visibility of sensitive viewpoints are illustrated in the Map Volume. For more detailed descriptions of methods and results, refer to the technical report and data tables. The technical reports and data tables are available for review at the agency offices listed (refer to Appendix H for the locations where technical reports can be reviewed).

Scenic Quality

Scenic quality was developed by rating the homogeneous landscape units mapped from the landscape character types. BLM and FS criteria were used for all public and undeveloped urban lands. Agricultural, urban, and developed lands were evaluated using other visual criteria developed for the project (refer to Table VR-2 of the technical report).

To evaluate the impacts of the SWIP alternatives equally, it is assumed that all landscapes have some inherent scenic value. Landscapes with the greater diversity of features are typically considered to have greater aesthetic appeal (e.g., high scenic quality). Though the current BLM's VRM scenic quality inventory guidelines consider "cultural modifications" (e.g., communities, rural residences, travel routes, etc.) as enhancements or detractions from the scenic quality of the landscape, the system is not particularly sensitive to landscapes dominated by agriculture (e.g., Snake River Plain). The FS's VMS, on the other hand, does not work well with developed areas.

VRM and VMS use slightly different procedures to establish scenic quality or variety class ratings. The BLM uses a numerical rating system that incorporates several key elements in rating scenic quality. These elements include landform, vegetation, water, color, influence of adjacent scenery, scarcity of features, and cultural modifications. The aggregation of these values determines the scenic quality class. The FS system describes landscape character in terms of landform, vegetation, and waterform to determine variety classes. Both systems classify the landscape into three levels of scenic quality or variety:

- Class A - distinctive
- Class B - common
- Class C - minimal

The BLM scenic quality classes and FS variety classes are described in Table 3-4. Also, refer to Table VR-5 in the technical report for detailed results of the scenic quality evaluation.

Viewpoints

Potentially critical viewpoints that may have visibility of the project were identified and inventoried within a corridor three miles either side of the assumed centerlines for each alternative, and outside the study corridors where long distance views were identified as an issue during project scoping (e.g., Great Basin National Park). Viewpoints were identified through personal contacts with agency visual resource specialists and review of the land use inventory data. The viewpoints inventoried include:

- individual residences and communities
- parks, recreation, and preservation areas
- highways, byways, and recreation destination access roads
- sensitive cultural sites (also refer to the Land Use and Cultural Resources section)

Distance Zones

Distance zones were established based upon visual perception thresholds for perceiving change in form, line, texture, color, and other visual perception factors. With an increasing distance from a viewpoint, landscape elements tend to become less obvious and detailed. The elements of form and line become more dominant than color or texture at greater viewing distances. Distance thresholds or zones are generally defined by FS as foreground (0 to 1/4 to 1/2 mile), middleground (1/4 to 1/2 to 3-5 miles), and background (3-5 to 15 miles). BLM recognizes similar distance zones but combines foreground and middleground and defines the distance zone of seldom seen as areas not visible from sensitive viewpoints, or viewing distances beyond 15 miles.

The visible perception of a typical 500kV transmission line in the context of landscapes was considered in determining the division of the visible area into distance zones. For this study, the following five distance zones were used to establish project visibility from sensitive viewpoints (Jones & Jones 1976):

- 0 - 1/4 mile
- 1/4 mile - 1 mile
- 1 mile - 3 miles
- beyond 3 miles
- seldom seen

Visual Sensitivity

Both the BLM and the FS visual systems define visual sensitivity as a measure of viewer concern for potential perceptible changes in scenic resources. Though the BLM and the FS

vary in their individual methods of analysis for visual sensitivity, both systems consider similar criteria in their evaluations. The approach for this study incorporates criteria from both systems and draws from previous experience on visual studies conducted for transmission lines throughout the western United States on public lands and national forests. These criteria were distilled into two key parameters: user type/user attitude and use volume. These parameters were used to assign overall visual sensitivity levels to the inventoried viewpoints.

Visual sensitivity levels vary according to the types of users and their attitudes. Consideration of the local, regional, or national significance of a viewpoint or viewed area helped to establish the attitudes of viewers. For example, national park viewpoints are typically considered more sensitive than interstate highways. Residential, recreation, and roadway views were considered. Each viewpoint was assigned a value of high, moderate, or low based on the estimated level of concern that would be expected of particular viewer types (e.g., sightseers, commuters).

Views seen by large numbers of people may potentially be more sensitive. On the other hand, a high volume of viewers with a low concern for changes in the scenic resource would not necessarily warrant a high level of visual sensitivity. For example, an interstate highway with a large volume of commercial and destination-oriented traffic would not necessarily be highly sensitive. With this in mind, each viewpoint was assigned a value of high, moderate, or low based on the number of potential viewers.

The evaluations of user type/attitude and use volume were combined to produce an overall visual sensitivity level. For the purposes of determining significant impacts, only viewpoints with a high or moderate visual sensitivity were assessed for potential visual impacts in this study.

VRM/VQO Classes

Visual management objectives (VRM classes and VQOs) are designated in agency resource plans for most of the study area (e.g., BLM Resource Management Plans and Forest Plans). These objectives define the acceptable degree of visual change for the natural landscape. Both the BLM and FS derive visual management objectives for their lands by considering scenic quality (BLM) or variety class (FS), visual sensitivity, and visibility from sensitive viewpoints.

The BLM has four VRM classes to manage the visual resources on public lands. VRM classes are determined by combining the visual resource elements mentioned above. Class I is a special designation applied to existing Wilderness areas, some natural areas and ACECs, and other areas where the management policy or legislative mandate is to restrict changes to the natural processes of the landscape.

The FS uses five VQOs to manage visual resources, which are determined based on the established FS VMS guidelines. As with Class I on BLM lands, Preservation is a special designation reserved for protected areas. VQOs have been mapped for the national forest

lands within the study corridors. For a description of VRM classes and VQOs, refer to Table 3-5. The Visual Resources maps in the Map Volume show the areas along the routes that would not comply with VRM Class I and Class II designations.

Results

Alternative Routes - Midpoint to Dry Lake

Route A

Scenic Quality/Variety Class - From the Midpoint Substation to Jackpot, Nevada, Class A areas occur primarily in Idaho along the Snake River Canyon (Link 41). The Salmon Falls Creek Reservoir (Link 71) located adjacent to Browns Bench is the largest Class B area inventoried in Idaho. Agricultural lands adjacent to the Snake River Canyon (Link 41) were also inventoried. The rural agricultural landscape contains diversity in form, line, texture, and color similar to what might be inventoried in the natural landscape as Class B scenery. In Idaho, Class C scenery occurs predominantly in the flat, open sagebrush desert land north and south of the Snake River in Idaho (Links 10, 20).

Within the study corridors from Jackpot, Nevada to the North Steptoe substation site, Class B scenery typically occurs in mountain and foothill landscapes including the Granite Range (Links 101, 102, 110), Windermere Hills (Link 1612), Currie Hills (Link 250) and the Schell Creek Range (Link 259). Class C is the predominant scenic quality rating for landscapes in Nevada, occurring primarily within the intermountain basin landscape character type.

From North Steptoe substation site to the Dry Lake substation site, Class A scenery occurs within the study corridor in the northern portion of the Pahranagat Wash (Links 690, 700). Class B scenery occurs near Gap Mountain (Link 672) and Delamar Mountain (Link 675), and the Arrow Canyon Range (Links 700, 720).

Sensitive Viewpoints and Visibility - Views from rural residences and along the fringe of small communities between Midpoint Substation and Jackpot, Nevada were considered highly sensitive. In Idaho, these high sensitivity views occur near Hansen (Links 20, 41), Eden (Links 20, 41), Rogerson (Links 40, 50). In addition, there are sensitive residential views from Jackpot, Nevada (Links 713, 715, 101, 110). Foreground and middleground views from these residences would occur along this route.

Developed recreation sites and areas with high visual sensitivity identified along Route A in Idaho include foreground views from the Minidoka Relocation Center Interpretative Site (Link 20) northwest of Eden and middleground views from a private recreation development called Nat-Soo-Pah located over a mile from the assumed centerline. Several existing and proposed BLM campgrounds that would have middleground views are located within the Salmon Falls Reservoir (SRMA) were also inventoried as high sensitivity viewpoints. Views from these sites are located on or near the water line of the reservoir and are expected to be

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screened. However, the roads that access these sites are also high sensitivity viewpoints. The route would be viewed in the foreground where it would cross these roads.

Route A would cross Interstate 84 (Link 41) in Idaho, inventoried as a moderate sensitivity travel route. The portions of U.S. Highway 93 within the study corridor of this route in Idaho and Nevada were inventoried as a moderate sensitivity travel route. These travel routes would be viewed from the foreground where it would cross these highways.

Foreground and middleground views from residences would occur between Jackpot, Nevada and the North Steptoe substation site, where Route A would encounter high sensitivity viewpoints near the residential community of Contact, Nevada (Links 713, 101, 102, 110) and isolated residences near Rock Creek in the Steptoe Valley (Link 270).

From the North Steptoe substation site and the Dry Lake substation site, Route A would affect high sensitivity recreation viewpoints within foreground view where it would cross the Pony Express Trail (Link 270) and the Kane Springs Back Country Byway (Links 690, 700). In addition, the route would be visible from the foreground and the middleground by dispersed recreation users in the southern end of the Pahranagat National Wildlife Refuge, the Evergreen WSA (Link 690), the Delamar WSA (Link 690), the Desert National Wildlife Refuge (Link 690), the Fish & Wildlife 1, 2, & 3 WSAs (Link 700), and the Arrow Canyon WSA (Links 700, 720).

The portion of the U.S. Highway 93 (Link 675) from Majors Place, Nevada south to Crystal Springs is a designated scenic route in Nevada and was inventoried as a high sensitivity viewpoint.

VRM - From the Midpoint Substation to Jackpot Nevada, Route A would affect approximately 1.8 miles of a VRM Class I area where it would cross the Salmon Falls Reservoir SRMA adjacent to Browns Bench (Link 70). The route would encounter VRM Class II areas for 0.4 miles (Link 41) southwest of Murtaugh, Idaho and for 0.6 miles near Eden where it would cross the Snake River Canyon (Link 41).

From Jackpot, Nevada to the North Steptoe substation site, Route A would cross VRM Class II areas for 3 miles in the foothills southwest of Jackpot (Links 711, 72) and 1 mile in the Windermere Hills (Link 1612) northeast of Wells. This route would also cross VRM Class II areas for .5 mile along the eastern toe of the Pequop Mountains (Link 211) and 0.5 miles west of Oasis and Bishop Creek (Link 162).

Class III areas that would be crossed along this route occur south of Contact, Nevada (Link 110) and south of Contact, Nevada (Link 130), adjacent to Interstate 80 (Link 211), and north of Contact, Nevada (Link 101).

From the North Steptoe substation site to the Dry Lake substation site, VRM Class II areas would be crossed for about 1.3 miles in the southern portion of the Arrow Canyon Range (Link 700) and for 1.3 miles east of the Pahranagat National Wildlife Refuge (Link 690). VRM Class II would also lie immediately adjacent and parallel approximately 12 miles along this portion of the route.

VRM Class III areas that would be crossed by Route A include areas in the Egan Range (Links 310, 340), south of Lages Station in the Schell Creek Range (Link 259), and the Steptoe Valley near Cherry Creek Station (Links 261, 263, 270). All other areas inventoried within the study corridors were VRM Class IV.

Route B

Scenic Quality/Variety Class - Route B is the same as Route A from Midpoint Substation to Jackpot, Nevada. From Jackpot, Nevada to the North Steptoe substation site, Class B scenery identified within the study corridors typically occurred in the mountains and foothills. Areas of Class B scenery include the Granite Range (Links 91, 92, 140), Toano Range (Link 222), and the Schell Creek Range (Link 259). From North Steptoe substation site to the Dry Lake substation site, the scenic quality affected by Route B would be that same as is that described for Route A.

Sensitive Viewpoints and Visibility - From Midpoint Substation to Jackpot, Nevada, the high and moderate sensitivity viewpoints for Route B are the same as those described for Route A, above.

From Jackpot, Nevada to the North Steptoe substation site the Pony Express Trail (Links 270, 280) and the California Trail Scenic Back Country Byway in the Elko District (Link 151) were identified as high visual sensitivity recreation viewpoints. Foreground views would occur in the locations where these trails would be crossed.

Route B would also encounter high sensitivity viewpoints in the foreground and middleground near the residential community of Contact, Nevada (Links 713, 101, 102, 110) and isolated residences near Rock Creek in the Steptoe Valley (Link 270).

This route would affect moderate sensitivity viewpoints where it would cross Interstate 80 at Silver Zone Pass and where it would parallel and cross U.S. Highway 93 Alternate from west of Wendover to the North Steptoe substation site. Near Robinson Summit, this route would cross U.S. Highway 50, the Loneliest Highway, east of Ely, Nevada, also inventoried as a moderate sensitivity viewpoint. The route would be viewed in the foreground where these crossings occur.

From the Robinson Summit substation site to the Dry Lake substation site, the high and moderate sensitivity viewpoints for Route B are the same as those described for Route A, above.

VRM - From the Midpoint Substation to Jackpot, Nevada, the VRM descriptions for Route B are the same as those for Route A.

From Jackpot, Nevada and the North Steptoe substation site, Route B would cross VRM Class II areas for approximately .5 mile adjacent to Salmon Falls Creek (Link 91), for 2.2 miles across the Interstate 80 low visibility corridor east of Wells (Link 222), and for 4 miles adjacent to the Goshute Mountains (Link 226).

Route B would cross VRM Class III areas in the Felt Wash (Link 222), adjacent to Trout Creek (Links 91, 92), in the Boone Springs Hills (Link 226), and adjacent to the Dead Cedar Wash east of the Goshute Mountains (Link 224).

From the Robinson Summit substation site to the Dry Lake substation site, the VRM designations affected by Route B are the same as those described for Route A, above.

Route C

Scenic Quality/Variety Class - Route C is the same as Route A from Midpoint Substation to Jackpot, Nevada. From Jackpot, Nevada to the vicinity of Oasis (Link 200), Nevada, the scenic quality for Route C is the same as that described for Route B. From the vicinity of Oasis to the Dry Lake substation site, the scenic quality affected by Route C would be the same as those described for Route A.

Sensitive Viewpoints and Visibility - From Midpoint Substation to Jackpot, Nevada, the high and moderate sensitivity viewpoints for Route C are the same as those described for Route A, above. And, from Jackpot to the vicinity of Oasis (Link 200), the high and moderate sensitivity viewpoints for Route C are the same as described for Route B. From the vicinity of Oasis to the Dry Lake substation site, the high and moderate sensitivity viewpoints for Route C are the same as described for Route A.

VRM - From the Midpoint Substation to Jackpot, Nevada, the VRM descriptions for Route C are the same as those for Route A. And, from Jackpot to the vicinity of Oasis (Link 211), the VRM descriptions for Route C are the same as described for Route B. From the vicinity of Oasis to the Dry Lake substation site, the VRM descriptions for Route C are the same as described for Route A.

Route D

Scenic Quality /Variety Class - Route D is the same as Route A from Midpoint Substation to HD Summit (Link 162), northeast of Wells, Nevada.

From HD Summit to the North Steptoe substation site, Route D would encounter areas of Class B scenery within the study corridors along the southern edge of the Windermere Hills (Link 180), in the Pequop Mountains (Link 190), and the Schell Creek Range (Link 259).

From the North Steptoe substation site to the Dry Lake substation site, the scenic quality affected by Route D would be the same as those described for Route A.

Sensitive Viewpoints and Visibility - From Midpoint Substation to HD Summit (Link 162), northeast of Wells, Nevada, the high and moderate sensitivity viewpoints for Route D are the same as those described for Route A.

From HD Summit to the North Steptoe substation site, high sensitivity viewpoints within foreground and middleground views of the route included residences in or near the communities of Contact (Links 712, 713, 101, 110), and Wells, Nevada (Link 180). High sensitivity recreation viewpoints within the study corridors include the Pony Express Trail (Links 270, 291). The Kane Springs Back Country Byway in the BLM Las Vegas District is also considered a high sensitivity viewpoint (Links 690 and 700). The route would be viewed within the foreground where these crossings occur. In addition, foreground and middleground views from dispersed recreation users in the Goshute Canyon WSA (Link 241) were also considered highly sensitive. The portions of Interstate 80 (Link 180) and U.S Highway 93 (Link 190) that would be crossed by this route were also inventoried as high sensitivity viewpoints and would occur within foreground views.

VRM - From the Midpoint Substation to HD Summit (Link 162), the VRM descriptions for Route D are the same as those for Route A.

From HD Summit to the North Steptoe substation site, Route D would cross VRM Class II areas for 5.3 miles across the Interstate 80 low visibility corridor east of Wells (Link 180) and for 5 miles, west of Bishop Creek (Links 165, 166, 1611, 162).

The route would cross VRM Class III areas in the Pequop Mountains (Link 190), west of the Wood Hills (Link 180), south of Contact (Links 102, 110, 130) and in the Steptoe Valley (Links 241, 243, 245).

From the North Steptoe substation site to the Dry Lake substation site, the VRM descriptions for Route D are the same as described for Route A.

Route E

Scenic Quality/Variety Class - From Midpoint Substation to the vicinity of Oasis (Link 200), Nevada, the scenic quality for Route E is the same as described for Route A. From the vicinity of Oasis to the Dry Lake substation site, the scenic quality for Route E is the same as those described for Route B.

Sensitive Viewpoints and Visibility - From Midpoint Substation to the vicinity of Oasis (Link 200), Nevada, the high and moderate sensitivity viewpoints for Route E are the same as those described for Route A. From the vicinity of Oasis to the Dry Lake substation site, the high and moderate sensitivity viewpoints for Route E are the same as those described for Route B.

VRM - From Midpoint Substation to the vicinity of Oasis (Link 200), Nevada, the VRM descriptions for Route E are the same as those described for Route A. From the vicinity of Oasis to the Dry Lake substation site, the VRM descriptions for Route E are the same as those described for Route B.

Route F

Scenic Quality/Variety Class - From the Midpoint Substation to Jackpot, Nevada, the only Class A scenery affected by this route is Salmon Falls Creek Canyon (Link 64) in Idaho.

Class B scenery in Idaho is primarily associated with the Snake River Canyon, Salmon Falls Creek Canyon, and Salmon Falls Creek Reservoir (Links 61, 64, 70). Class C landscapes occur throughout Idaho and Nevada within the intermountain basin landscape character type, and are the predominant scenic quality class.

From Jackpot, Nevada, to the vicinity of Oasis, Nevada (Link 200), the scenic quality for Route F is the same as those described for Route A. From the vicinity of Oasis to the Dry Lake substation site, the scenic quality for Route F is the same as those described for Route B.

Sensitive Viewpoints and Visibility- From Midpoint Substation to Jackpot, Nevada, foreground and middleground views from rural residences and along the fringe of small communities were considered highly sensitive. Route F would be visible from residences in the communities of Hagerman, Idaho (Links 61, 62) and Jackpot, Nevada (Link 72).

In Idaho, high sensitivity recreation viewpoints within foreground and middleground views identified along this route include Malad Gorge State Park, the visitors center near Hagerman, the Hagerman Fossil Bed National Monument, and the proposed visitor center on the Snake River in Idaho (Links 61, 62, 64). The viewpoint from the visitor center would be from the east side of the Snake River, a much lower elevation. Where visitors would look to the west and up the river bluffs, the route would be visible against the skyline. Foreground views of the route within the Balanced Rock State Park (Link 64) are also treated as high sensitivity viewpoints.

U.S. Highway 30 (Link 61) through Hagerman, a designated scenic route, was the only high sensitivity travel route identified in Idaho. Moderate sensitivity travel routes include Interstate 84 near Hagerman (Link 61) and U.S. Highway 93 in Idaho and Nevada. Foreground views of the route would occur where these travel routes would be crossed.

From Jackpot, Nevada to the vicinity of Oasis, Nevada (Link 200), the sensitive viewpoints described for Route F are the same as those described in Route B. From the vicinity of Oasis to the Dry Lake substation site, the sensitive viewpoints described for Route F are the same as those described in Route A.

VRM - From the Midpoint Substation to Jackpot, Nevada, VRM Class I areas occur adjacent to Salmon Falls Creek (Link 64, 70), within the Hagerman Fossil Beds National Monument (Link 64), south of this national monument around a rutted portion of the Oregon Trail, and along portions of the Snake River Canyon (Link 61) north of Hagerman.

Areas of VRM Class II occur in the foothills southwest of Jackpot (Link 72) and along Salmon Falls Creek (Link 61). VRM Class III areas occur northeast of Hagerman, Idaho (Link 61) and just west of the Midpoint Substation (Link 61).

From Jackpot, Nevada to the vicinity of Oasis, Nevada (Link 200), the VRM descriptions for Route F are the same as those described for Route B. From the vicinity of Oasis to the Dry Lake substation site, the VRM descriptions for Route F are the same as those described for Route A.

Route G

Scenic Quality/Variety Class - Route G is the same as Route A from the Midpoint Substation to Jackpot, Nevada. From Jackpot to the vicinity of Oasis, Nevada (Link 200), Class B scenery typically occurs in mountain and foothill landscape character types and includes portions of the Granite Range (Links 101, 102, 110) and Windermere Hills (Link 151). Class C is the predominant scenic quality rating for landscapes in Nevada, occurring primarily within the intermountain basin landscape character type.

From the vicinity of Oasis (Link 200) to the North Steptoe substation site, Route G would encounter areas of Class B scenery within the study corridors along the southern edge of the Windermere Hills (Link 180), in the Pequop Mountains (Link 190) and in the Steptoe Valley (Link 241).

From the North Steptoe substation site to the Dry Lake substation site, scenic quality along Route G is the same as that described for Route B.

Sensitive Viewpoints and Visibility - From the Midpoint Substation to Jackpot, Nevada, the high and moderate sensitivity viewpoints for Route E are the same as those described for Route A.

From Jackpot, Nevada to the North Steptoe substation site, Route G would pass within foreground view of the Winecup Ranch, a high sensitivity viewpoint. This route would also affect U.S. Highway 93 where it would cross the highway and be viewed within the foreground.

From the North Steptoe substation site to the Dry Lake substation site, the high and moderate sensitivity viewpoints for Route G are the same as those described for Route A.

VRM - From Midpoint Substation to Jackpot, Nevada, the VRM descriptions for Route G are the same as those described for Route A. From Jackpot to the North Steptoe substation site, VRM descriptions for Route G are the same as those described for Route A. From the North Steptoe substation site to the Dry Lake substation site, VRM descriptions for Route G are the same as those described for Route D.

Alternative Routes - Ely to Delta

Direct Route

Scenic Quality/Variety Class - No designated Class A scenery would be affected by this route. Class B scenery in Nevada occurs primarily in the mountains and foothills landscape character type. Class B scenery occurs along this route in the Schell Creek Range (Link 263) and adjacent to Kern Mountain (Link 266).

The predominant scenic quality class in the intermountain basin landscape character type in Nevada and Utah is Class C. No Class A or Class B scenery would be affected by this route in Utah.

Sensitive Viewpoints and Visibility - Views from residences on the fringe of rural communities were considered high sensitivity viewpoints. This route would be viewed in the middleground from a ranch at the base of the Schell Creek Range (Link 262). Foreground views from residences would occur near Sugarville, Utah (Link 580), north of the Delta area.

High sensitivity recreation viewpoints identified along this route include the Pony Express Trail (Links 265, 266) near Stonehouse, Nevada, at the southern portion of the Antelope Range. The route would be viewed in the foreground where it would cross portions of this trail. In addition, the route would be visible in the foreground and middleground by dispersed recreation users in the Fish Springs and Swasey Mountain WSAs (Link 630).

VRM - No VRM Class II areas would be affected by this route. The Direct Route would cross areas of VRM Class III in the Little Hills (Link 266) and where it would cross the Schell Creek Range from Steptoe Valley (Links 262, 263). The remainder of the lands that would be crossed by this route are VRM Class IV.

Cutoff Route

Scenic Quality/Variety Class - This route would cross through Marjum Canyon, an area of designated Class A scenery, parallel to two existing 230kV transmission lines. Class B scenery occurs primarily in the mountains and foothills landscape character type. Class B scenery in Nevada occurs where the route would cross the Schell Creek Range (Link 263) and adjacent to Kern Mountain (Link 266). Class B scenery in Utah occurs in the Middle Range (Link 462) and Sawtooth Range (Link 462).

The predominant scenic quality class in the intermountain basin landscape character type in Nevada and Utah is Class C. The majority of the study area in Utah is Class C scenery consisting of areas in the "West Desert".

Sensitive Viewpoints and Visibility - Views from residences on the fringe of rural communities were considered high sensitivity. This route would be viewed in the

foreground and middleground from residences in the areas of Sugarville (Link 580) and Delta, Utah (Link 580). Other isolated rural residences in the agricultural lands around Delta would view this route in the middleground.

High sensitivity recreation viewpoints that would be affected by this route include the Pony Express Trail (Link 266), where portions of this trail would be crossed and viewed within the foreground. Views from dispersed recreation users in the Notch Peak WSA (Link 462), the Swasey Mountain WSA (Link 470), and the Howell Peak WSA (Link 462) were also considered high sensitivity.

The high sensitivity travel routes affected by this route are recreation destination roads that provide access into WSAs mentioned above. Moderate sensitivity travel routes include U.S. Highway 50 adjacent to Kings Canyon (Link 462).

VRM - No VRM Class II areas would be affected by this route. The Cutoff Route would cross areas of VRM Class III in the Little Hills (Link 266) and where it would cross the Schell Creek Range from Steptoe Valley (Links 262, 263). In addition, the route would cross VRM Class III areas in the Little Valley (Link 267) and in the Marjum Canyon (Link 462). The remainder of the lands that would be crossed by this route are VRM Class IV.

230kV Corridor Route

Scenic Quality/Variety Class - Like the Cutoff Route, this route would cross through Class A scenery in Marjum Canyon parallel to two existing 230kV transmission lines.

Class B scenery in Nevada primarily occurs in the mountains and foothills landscape character type. Class B scenery occurs on this route in the Egan Range (Link 350), the Humboldt Creek Range (Link 380) and the Snake Range (Link 460). Class B scenery in Utah occurs in the Middle Range (Link 462) and Sawtooth Range (Link 462).

In addition, this route would cross through areas of variety Class B scenery where the route would parallel two existing 230kV transmission lines through the Cooper Canyon area, at the southern end of the Schell Creek Range within the boundaries of the Humboldt National Forest.

Class C scenery in Nevada and Utah occurs in the intermountain basin landscape character type, and is the predominant scenic quality class. The majority of the study area in Utah is Class C scenery consisting of areas within the "West Desert".

Sensitive Viewpoints and Visibility - A number of high sensitivity views from residences occur in the vicinity of Ely, Nevada. Several residences in Smith Valley (Link 350), along the north edge of the Cross Timber Subdivision west of the Hercules Gap (Link 350), the east edge of the Sweetwater Estates Subdivision on the east edge of the Steptoe Valley (Link 370) would view the route in the foreground and middleground.

In Utah, this route would be visible in the foreground from two isolated ranches at the west edge of the Snake Valley (Link 462), south of the community of Baker. This route would also be viewed in the foreground and middleground from residences in the areas of Sugarville (Link 580). Other isolated rural residences in the agricultural lands around Delta would view this route in the middleground.

The route would be visible in the foreground from a proposed BLM primitive campground at Weaver Creek (Link 460). Other high sensitivity recreation viewpoints in Nevada, viewed in the middleground or background, include Cave Lake State Recreation Area (Link 380), the Swamp Cedar Instant Study Area (Link 380), the Osceola Arch (Link 460), and a proposed BLM campground in Sacramento Pass (Link 460).

The 230kV Corridor Route would be visible in the background from viewpoints within Great Basin National Park (Links 460, 461). The viewpoints include Mahogany Overlook, Lehman Creek Overlook, Wheeler Peak, Lehman Caves Visitor Center, Baker Ridge Visitor Center. Though these viewpoints are located outside the study corridors, they were included in these studies because of concerns raised during public scoping, concerns of the National Park Service, and their unique viewing conditions.

In addition, four interpretive sites located on approach routes to the Great Basin National Park were also inventoried as high sensitivity viewpoints. The sites are outside of the study corridor and would be located in the background. Two of these sites are located north of Lehman Creek approximately 2.5 miles east of Bald Mountain and two are located approximately 5 miles west of Baker and south of Lehman Creek. The locations of these interpretive sites are also identified in the Great Basin National Park Draft General Management Plan and DEIS (1991). The site locations are preliminary and were used for the purposes of these studies only.

In Nevada, the route would cross a portion of the Success Loop (Links 380), a high sensitivity travel route. This road, located southeast of Ely, also provides access to Cave Lake State Recreation Area. This route would also cross the recreation destination roads that provide access to the Swasey Mountain WSA (Link 470). Moderate sensitivity travel routes include U.S. Highway 93 (Links 352, 370), U.S. Highway 50/6 (Links 380, 460), and other secondary roads that access rural residential areas in the vicinity of Ely (Links 350, 370). This route would be visible in the foreground where these travel routes would be crossed.

High sensitivity travel routes in Utah, which would have foreground views of this route, include recreation destination roads that provide access to the Notch Peak WSA (Link 462), the Howell Peak WSA (Link 462), and the Swasey Mountain WSA (Link 470). Moderate sensitivity travel routes which are moderate sensitivity viewpoints include U.S. Highway 50 (Links 461, 462) and secondary roads in the agricultural area in the vicinity of Delta (Links 572, 580).

VRM - No VRM Class II areas would be affected by this route. The route would cross VRM Class III areas at the north end of the Egan Range (Link 350), north of Ely in the Steptoe Valley (Links 350, 351, 352), and areas east of Ely at the base of the Shell Creek Range (Link 370). In addition, the route would cross VRM Class III areas southeast of the Steptoe Creek

(Link 380), north of Majors Place outside the east boundary of the Humboldt National Forest (Link 380), the Sacramento Pass area (Link 460), and in the Marjum Canyon area (Link 462).

VQO - The route would cross areas with VQOs of Modification and Maximum Modification where the route would pass through Cooper Canyon in the Humboldt National Forest (Link 380).

Southern Route

Scenic Quality/Variety Class - No designated Class A scenery occurs along this route. Class B scenery in Nevada primarily occurs in the mountains and foothills landscape character type. Class B scenery would be crossed near the Egan Range (Link 340), the White River Valley (Links 362, 364), the Hamblin Valley Wash (Link 450), the Tunnel Spring Mountain (Link 451) and in the Confusion Range (Link 451).

Class C scenery in Nevada and Utah typically occurs in the intermountain basin landscape character type, and is the predominant scenic quality class. The majority of the study area in Utah is Class C scenery consisting of areas within the "West Desert".

Sensitive Viewpoints and Visibility - Views from residences on the fringe of rural communities were considered high sensitivity. This route would be viewed in the foreground and middleground from residences in the areas of Sugarville (Link 580) and Delta, Utah (Link 580). Other isolated rural residences in the agricultural lands around Delta would view this route in the middleground.

In Nevada, the Southern Route would be visible in the middleground to background from Ward Charcoal Ovens State Historic Site (Link 364), a highly sensitive recreation viewpoint. The route would cross the proposed Horse and Cattle Camp Back Country Byway (Link 364). Highly sensitive viewpoints from dispersed recreation users would occur along Link 451 in the Wah Wah Mountain, King Top, and Notch Peak WSAs.

Moderate sensitivity travel routes include U.S. Highway 50 (Link 451), Utah State Highway 21 (Link 451), and secondary roads in the vicinity of Delta.

VRM - The route would cross a VRM Class II area south of John Henry Wash near Majors Place in Nevada (Link 364). No VRM Class II areas would be affected by this route in Utah.

This route would cross VRM Class III areas in the Egan Range (Link 340), and in areas south of John Henry Wash (Link 420).

CHAPTER 3

Socioeconomics

Introduction

The demographic, economic, and fiscal attributes of the areas where alternative routes occur were inventoried to characterize and evaluate potential socioeconomic effects of the proposed project. From a socioeconomic perspective, areas of concern in transmission line siting include nearby communities, which could be affected by the influx of construction workers, and potentially affect economic activities and land uses, particularly livestock grazing, crop production, suitable timber areas, mining activities, residential developments, and tourist areas. Since the area of concern for socioeconomics is the county in which the project is located rather than a specific corridor, the socioeconomic inventory describes key features of those counties crossed by the alternatives. Counties crossed by the alternative routes include:

- Gooding, Jerome, Twin Falls, and Cassia counties in Idaho
- Elko, White Pine, Nye, Lincoln, and Clark counties in Nevada
- Millard and Juab counties in Utah

Methods

The major component of the research for the socioeconomic evaluation are the demographic and economic features of the region. The demographic topics include population size, age distribution, ethnicity, migration trends, and projected population. The economic subjects include current labor force and occupational distribution, employment levels, personal income, and economic base characteristics. Other fiscal characteristics included were tax code areas, tax rates, and assessed valuation.

Data and information were gathered primarily from secondary (existing) sources and through personal communications with selected community representatives. Secondary source materials included comprehensive plans, county statistical compendia, economic base analyses, and county profiles. These provide past, current, and projected demographic and economic information on the areas of interest. The sources include:

- Bureau of Economic Analysis, Department of Commerce
- the Nevada Employment Security Department, Department of Administration, Department of Taxation
- the Idaho Department of Employment Security, Department of Commerce, Division of Economic and Community Affairs
- the Utah Office of Planning and Budget, Department of Commerce/Bureau of the Census, Department of Employment Security
- numerous county departments

In areas where little secondary data were available, information was collected through a series of personal visits and telephone conversations. These discussions occurred with county and local planners, Chamber of Commerce personnel, and state officials responsible for economic development.

Results

A summary of demographic and economic characteristics by county is presented in Table 3-6. Fiscal characteristics are listed in Table 3-7, and population data for study area communities are listed in Table 3-8.

Alternative Routes - Midpoint to Dry Lake

Route A

Idaho - Route A would cross through Jerome and Twin Falls counties, and a small portion of Cassia county. Jerome County is a small and sparsely populated county of 601 square miles. The average population density is 25.2 persons per square mile. According to the U.S. Bureau of Census, the population of Jerome County decreased from 14,840 in 1980 to 14,600 in 1988. Since 1988, the population has increased to 15,138 in 1990 and state projections anticipate a further increase to 18,240 in 1995. Study area communities range in size from Eden with a 1990 population of 355 to Jerome with a population of 6,891 in 1990. Approximately 94 percent of the population is caucasian.

Primarily an agricultural county, there were 909 farms comprising 205,315 acres, an average of 226 acres per farm in 1987. The market value of farm products sold was $129,096,000. Other principal economic activities revolve around agricultural and ranching interests. Farm employment declined from 1,628 in 1980 to 1,582 in 1987, but still represented the largest employment sector. Employment in construction and trade sectors also declined between 1980 and 1987 while transportation, communications and public utilities, services, and government employment increased. There is no mining or lumber activity in Jerome County. Unemployment rose from 6.3 percent in 1980 to 8.4 percent in 1988. Since then it has fallen to 5.9 percent in 1990.

Twin Falls County, with 1944 square miles, is more than twice the size of neighboring Gooding and Jerome counties. The population density of Twin Falls County is 32.2 persons per square mile. Approximately 42 percent of the county's residents live in Twin Falls, which housed a population of over 26,209 in 1990, compared with a county total of 62,580. State projections for the county anticipate a population of more than 74,520 by 1995 and more than 93,000 by 2010. Similar to its neighbors to the north, the population of Twin Falls County is about 95 percent caucasian, with relatively small populations of other races.

In 1987, the county's 1,576 farms accounted for more than 552,000 acres of land, roughly half the acreage in the county. The market value of farm products sold was $161,656,000. Based

traditionally in agriculture and agriculture-related industries, the economy of Twin Falls County has diversified somewhat in recent years with new non-agricultural manufacturing activities and the promotion of tourism. Farm employment, which declined from 3,325 in 1980 to 2,528 in 1987, still represents the fifth largest employment sector in the county. The largest employment sector, services, increased more than 30 percent between 1980 and 1987. The unemployment rate of 4.8 percent for the county for fiscal year 1990 is lower than the both 1980 rate of 8.39 percent and the 1988 average of 5.8 percent.

Nevada - Route A crosses through Elko, White Pine, Lincoln, Nye, and Clark counties. Encompassing 17,135 square miles, Elko County is very large but sparsely populated. On the average, there are only two persons per square mile of land. With the recent resurgence in metals mining in Nevada, Elko County is again experiencing a mining boom. The county population has climbed from 17,269 in 1980 to 33,530 in 1990 and is expected to rise to 46,720 by 1995 (Office of the State Demographer, 1/16/91). Comprising over two-thirds of the county's population, the City of Elko grew from a population of 10,980 in 1986 to 14,736 in 1990. Approximately 85 percent of the population is caucasian and about 8.5 percent is Native American.

In 1989, principal employment sectors in Elko County were services (40.5 percent), trade (19.8 percent), government (14.6 percent), and construction (8.6 percent). The unemployment rate was 4.9 percent. Major influences on the local economy include the gaming industry, mining, and recreation.

Similar to Elko County, White Pine County's history mirrors the booms and busts of the mining industry. In the late 1970s and early 1980s, the county's population showed dramatic declines as a result of the closure of the Kennecott Mine in 1976 and later closure of the McGill smelter in 1983. Between 1970 and 1980, the population declined 21 percent to 8,167 people. Further declines brought the population to 7,560 in 1985. More recently, the population has increased, with a resurgence in the mining industry, to 9,264 in 1990. With a 1990 population of 4,756, Ely comprises approximately half of the county population. Ely, and the nearby communities of McGill and Ruth comprise a population of approximately 8,400, or about 90 percent of the county population. Population projections for the county vary according to assumptions about the mining economy. According to the 1991 estimate from the state demographer, the county's population will rise to 12,850 in 1995. A new prison constructed in the Ely area has brought an additional 1,000 new residents.

The primary employment sectors in White Pine County are mining followed by trade and government, services, construction, and transportation. Mining activity is high at this time. Operating mines include a large mine in Dry Gulch at the east edge of Spring Valley, the Crystal Queen mine, and several smaller mines at the base of the Schell Creek Range southeast of Ely. There is also high activity in claim staking in the county. The average county unemployment rate in 1989 was 6.2 percent.

Lincoln County is a large county of more than 10,000 square miles with a population density of far less than one person per square mile. With a population of 3,775 in 1990, Lincoln County has the smallest population of the study area counties. The county's population is expected to grow to 5,070 in 1995. In 1990, the population is 94 percent caucasian and about 1.5 percent Native American. The economy in Lincoln County is based on primarily

agricultural with a little mining activity and the Nevada Test Site in the southwestern portion of the county.

Compassing over 18,000 square miles, Nye County is the second largest county in the United States in land area. Like Lincoln County, Nye is sparsely populated with less than one person per square mile. The county's population is expected to rise from 17,781 in 1990 to 19,030 in 1995. Approximately 92 percent of the population is caucasian and about 2.8 percent Native American. The only incorporated town in Nye County is Gabbs at the far northwestern corner of the county with a population of 667 in 1990. The county seat, Tonopah, had a population of 1952 in 1980.

Encompassing approximately 8,000 square miles, Clark County has a population density of over 90 persons per square mile. The population of Clark County grew from 463,087 in 1980 to 741,459 in 1990. One of the fastest growing areas in the county, the Las Vegas Valley, including Las Vegas, North Las Vegas, and Henderson, accounted for over 95 percent of the county's population in 1980. In 1989, the county's population was 81 percent caucasian, 9.5 percent black, and 3.5 percent Asian/Pacific Island.

Route B

Since Route B is the same as Route A in Idaho, the inventory for Route A applies also to Route B. In Nevada, Route B would cross through the same counties as Route A. Refer to the description of the affected environment for Route A.

Route C

Since Route C is the same as Route A in Idaho, refer to the description of Route A above. In Nevada, since Route C would cross through the same counties as Route A, refer to the description of the affected environment for Route A.

Route D

Since Route D is the same as Route A in Idaho, refer to the description of the affected environment for Route A above. Since Route D would cross through the same counties as Route A in Nevada, refer to the description of the affected environment for Route A above.

Route E

Since Route E is the same as alternative A in Idaho, refer to the description of the affected environment for Route A above. Since Route E would cross through the same counties as Route A in Nevada, please refer to the description of the affected environment for Route A above.

Route F

Route F crosses through Jerome, Twin Falls and Gooding counties in Idaho. Twin Falls and Jerome counties are described under Route A above. Similar to Jerome County, Gooding County is both small and sparsely populated. With a total land area of 728 square miles, the average population density is approximately 16 persons per square mile. From the 1980 census count of 11,870, the population of Gooding County declined to 11,633 in 1990. State projections anticipate that the population will rise to 17,610 in 2010. Communities are small, ranging between Bliss with a 1990 population of 208 to Gooding, the county seat, with a population of 2,949. While there are small populations of black, Native American, Asian/Pacific Island and other races, about 93.5 percent of the county's population is caucasian.

The economy of Gooding County is based primarily on agriculture. In 1987, there were 729 farms comprising 239,328 acres. The average farm size is 328 acres. The market value of farm products sold was $112.7 million. As with Jerome County, the principal employment sector is farming, although farm employment declined from 1,428 in 1980 to 1,306 in 1987. Manufacturing, construction, and trade also declined during this period while transportation, communication and public utilities, finance, insurance, real estate, and services employment increased. The annual average unemployment rate rose from 4.8 percent in 1980 to 7.2 percent in 1984, and has declined to 4.3 percent in fiscal year 1990.

Since Route F would cross through the same counties as Route A in Nevada, refer to the description of the affected environment for Route A above.

Route G

Since Route E is the same as Route A in Idaho, refer to the description of the affected environment for Route A above.

Since Route G would cross through the same counties as Route A in Nevada, refer to the description of the affected environment for Route A above.

Alternative Routes - Ely to Delta

Direct Route

Nevada - The Direct Route would cross through the northeastern portion of White Pine County in Nevada through the Antelope Mountains to the Nevada-Utah state line. There are no sizeable communities near this portion of the route. Refer to Route A for general information on the socioeconomic characteristics of White Pine County.

Utah - The Direct Route would cross Millard and Juab counties in Utah. Prior to 1980, Millard County experienced a moderate growth rate of 2 to 3 percent annually. In the early 1980s, the Intermountain Generating Station was constructed, bringing the county's annual growth rate to 10 to 20 percent. The population of the county increased from 9,050 in 1980 to 14,200 in 1985. With reduction in construction employment for the Intermountain Generating Station, the population of Millard County dropped to 11,333 in 1990. Most of the population of the county is centered in the 10 incorporated communities, with the largest now being Delta. The population of Delta has dropped to 2,998 in 1990 from 7,400 in 1988 as a result of reductions in construction employment associated with the Intermountain Generating Station. The 1995 population for Millard County is projected to be 13,400.

Prior to development of the Intermountain Generating Station, the Millard County economy was primarily based on agricultural with some mining. Most of the agriculture in the county is irrigated. As of June 1986, the socioeconomic monitoring report for the Intermountain Generating Station reports a total of 2,602 relocatees or weekly commuters. Unemployment within the county is expected to vary somewhat with fluctuations in demands for construction and operation employees at the Intermountain Generating Station. The unemployment rate in the county rose from 4.6 percent in 1980 to 5.6 percent in 1988. Since then it has fallen to 4.2 percent in 1990.

Juab County, located to the north of Millard County, is primarily a rural county with a population density of less than two persons per square mile. The county's population has declined from 6,250 in 1985 to 5,817 in 1990. The 1995 population of Juab County is projected to be 5,900 in 1995. Unemployment has been high in Juab County. In 1989, the annual average unemployment rate was 9.6 percent. Since then it has fallen to 6.4 percent in 1990. Principal employment sectors are government and trade.

Cutoff Route

In Nevada, the Cutoff Route is the same as the Direct Route in White Pine County. The affected environment for the Direct Route is described above.

In Utah, the Cutoff Route would cross into Millard County along a different course than the Direct Route but both routes pass through sparsely populated country. The closest communities to the Cutoff Route are Gandy, Robinson Ranch, Hinckley, and Delta. This route converges with the 230kV Corridor Route east of the Conger Range. A description of the socioeconomic characteristics of Millard County is presented under the Direct Route.

230kV Corridor

The 230kV Corridor would pass through White Pine County parallel to two existing 230kV transmission lines. Refer to the Direct Route descriptions for socioeconomic characteristics of White Pine County. This route would originate west of Ely, Nevada, at the Robinson Summit substation site and would pass approximately one mile north of Great Basin National Park near Baker, Nevada.

The 230kV Corridor Route would cross into Millard County, Utah just north of Highway 6/50 and would continue to parallel the existing 230kV transmission lines. This route would pass near the communities of Ely and Baker in Nevada and Hinckley and Delta in Utah. The socioeconomic characteristics of Millard County are described under the Direct Route.

Southern Route

In Nevada, the Southern Route would originate west of Ely and would pass through White Pine County to the south of the other alternatives. This route would cross the Egan Range south of Ely then would cross Spring Valley just north of the Lincoln-White Pine county line.

In Utah, the Southern Route would pass through Millard County to the south of the other alternatives. This route would pass near the communities of Hinckley and Delta.

Electric and Magnetic Fields

Introduction

The proposed SWIP transmission line is a 500kV class transmission line, which would operate at a maximum voltage of 550kV. This voltage generates electric and magnetic fields in the space between the conductors and ground. The purpose of this report is to quantify the levels and expected impacts from the SWIP 500kV transmission line. This section covers:

- electric field near ground
- magnetic field near ground
- corona (audible noise, radio interference, television interference)

There is currently no national standard in the United States for power frequency electric and magnetic fields. However, several states have been active in establishing mandatory or suggested limits on 60 hertz (Hz) electric and, in two cases, magnetic fields. Seven states have specific electric field limits that apply to transmission lines: Florida, Minnesota, Montana, New Jersey, New York, North Dakota, and Oregon. These regulations are summarized in Table 3-9, adapted from Transmission/Distribution Health & Safety (TDHS) Report [1989]. Florida and New York have established regulations for magnetic fields.

Electric field limits for the states have been given in terms of maximum field or edge-of-right-of-way field, or both. Except for Florida, regulations have not explicitly stated the operating conditions under which the limits apply. The Florida regulation was adopted after extensive public hearings and controversy. The law states: "Although there is no conclusive evidence that there is any danger or hazard to public health at levels of existing 60 hertz electric and magnetic fields found in Florida, there is evidence of a potential for adverse health effects on the public. Further research is needed to determine if there are effects and the exposure levels at which effects may occur." [Florida Department of Environmental Regulation, 1989] The Florida electric field strength standard is based on (1) the avoidance of perception of the

field at the edge or on the right-of-way and on (2) the levels near existing facilities. The electric field strength limit in Florida has been set at 2 kilovolts/meter (kV/m) at the edge of the right-of-way and 8 Kv/m on the right-of-way for 230kV or smaller lines. For 500kV lines the electric field shall not exceed 10 kV/m on the right-of-way.

The Florida magnetic field limit at the edge of the right-of-way is 150 milligauss (mG) for lines of 230kV or less and 200mG for 500kV lines.

The Minnesota 8 kV/m maximum field limit is applied on a case-by-case basis by the Minnesota Environmental Quality Board (MEQB), which has jurisdiction over lines of nominal voltage 200kV and higher. The limit is included in construction permits granted by the MEQB rather than in a formal rule [e.g., Minnesota Environmental Quality Board (MEQB), 1977]. Minnesota does not have an edge-of-right-of-way field limit.

The Montana Board of Natural Resources and Conservation (BNRC) imposed a 1 kV/m electric-field limit at the edge of the right-of-way in residential and subdivided areas for the BPA Garrison-Spokane 500kV Transmission Project [BNRC, 1983]. The administrative rules incorporating this requirement were adopted in 1984 [Jamison, 1986]. These rules apply to lines designed for operation at 69kV and higher, over which the BNRC has routing authority. An affected landowner may waive the 1 kV/m requirement. An additional requirement in the rules is a 7 kV/m limit at road crossings. The 1 kV/m electric-field limit was adopted because of the degree of protection and assurance to the public it provided and because of the small amount of additional right-of-way required [Jamison, 1986]. Although Montana does not have a magnetic field limit, the imposition of the 1kV/ m electric field limit assures that edge-of-right-of-way magnetic fields would be less than 0.050 gauss [Jamison, 1986].

In New Jersey the Department of Environmental Protection (NJDEP), Bureau of Radiation Protection, established interim guidelines for maximum field levels at the edge of the right-of-way [New Jersey Commission on Radiation Protection (NJDEP), 1981]. Their 3 kV/m limit is in the form of a resolution and is not enforced but rather serves as a guideline for evaluating complaints.

The New York edge-of-right-of-way electric field limit resulted from the extensive public hearings on 765kV lines before the New York Public Service Commission (NYPSC) from 1975 to 1977. The opinions issued by the NYPSC in this case required that the interim edge-of-right-of-way electric-field limit be equivalent to that for 345kV lines NYPSC, 1978a, 1978b. This resulted in an edge-of-right-of-way limit of approximately 1.6 kV/m. This limit was explicitly implemented by specification of a 350-foot right-of-way width for 765kV lines. In addition, electric fields on public roads, private roads, and other terrain were limited to 7, 11, and 11.8 kV/m, respectively. These values were intended to limit the induced current to the largest anticipated vehicle to 4.5 milliampere (mA). The NYPSC also required that the utilities involved fund additional research in the area of biological effects of electric and magnetic fields. The final report of the New York State Scientific Advisory Program was issued in 1987 [Ahlbom et al., 1987]. New York adopted an edge-of-right-of-way magnetic field standard of 200 mG in August 1990 [TDHS Report, 1990].

The North Dakota Public Service Commission (NDPSC) has used an informal requirement of 9 Kv/m maximum field strength for transmission lines in that state [Banks, 1986]. This level is not explicitly cited in its orders. However, the NDPSC has addressed the question of adverse health effects directly and found no credible evidence which demonstrates any significant adverse biological or other environmental effects of transmission lines for the transmission lines under review.

Oregon has a formal rule in its transmission line siting procedures that specifically addresses field limits. The Oregon limit of 9 Kv/m is applied to areas accessible to the public [Oregon, 1980]. The Oregon rule also addresses grounding practices, audible noise, and radio interference.

Government agencies operating transmission systems have established design criteria, which include electric field levels. The BPA has maximum allowable fields of 9 and 5 Kv/m on and at the edge of the right-of-way, respectively [Lee et al., 1989]. BPA also has maximum-allowable electric field strengths of 5 Kv/m, 3.5 Kv/m, and 2.5 Kv/m for road crossings, shopping center parking lots, and commercial/industrial parking lots, respectively. These levels are based on limiting the maximum short-circuit currents from anticipated vehicles to less than 1 Ma in shopping center lots and to less than 2 Ma in commercial parking lots.

The peak electric fields from the proposed transmission line would meet all state regulatory limits except that in Minnesota. The edge of right-of-way electric fields from the proposed line would meet criteria set in Florida and New Jersey but not those established in New York and Montana. The magnetic field at the edge of the right-of-way from the proposed line would be below the regulatory levels of states where such regulations exist.

Methods

The electric fields, magnetic fields, and corona effects from the proposed line were calculated using the BPA Corona and Field Effects Program (BPA, undated). Electric and magnetic fields for the proposed line were calculated at a height of 3.28 feet (1 meter). Calculations were performed out to the edge of the proposed 200 foot right-of-way for each. Because maximum voltage and current, and conductor height at a conductor temperature of 120° F (49 C) above ground are used, the calculated values given here represent worst case conditions (i.e., the calculated fields are higher than they would be in practice).

Corona computations were made under conditions of average operating voltage estimated as 2.5 percent above nominal. Levels of audible noise, radio interference and television interference are predicted for both fair and foul weather, however corona is basically a foul weather phenomenon.

The proposed SWIP 500kV line would parallel lines of various voltages along segments of the alternative routes. Seventeen possible parallel configurations were identified and analyzed. The field and corona effects levels were computed for the existing conditions (before the SWIP) and for all parallel lines with the addition of the proposed SWIP alternatives (refer to Chapter 4).

Results

Electric Field

An electric field is said to exist in a region of space if a charge, at rest in that space, experiences a force of electrical origin (i.e., electric fields cause free charges to move). Electric field is a vector quantity that is, it has both magnitude and direction. The direction corresponds to the direction a positive charge would move in the field. Sources of electric fields are unbalanced electrical charges (positive or negative) and time-varying magnetic fields. Transmission lines, distribution lines, house wiring, and appliances generate electric fields in their vicinity because of unbalanced electrical charge on unshielded energized conductors. Electric fields are expressed in units of volts per meter (V/m) or kilovolts (thousands of volts) per meter (kV/m).

The spatial uniformity of an electric field depends on the source of the field and on the distance from that source. On the ground under a transmission line the electric field is nearly constant in magnitude and direction over distances of a few meters. However, in close proximity to transmission or distribution line conductors the field decreases rapidly as distance from the conductors increases. Similarly, near small sources such as appliances, the field is not uniform and falls off even more rapidly with distance from the device. If an energized conductor (source) is inside a grounded conducting enclosure, then the electric field outside the enclosure is zero and the source is said to be shielded.

The electric field created by a high voltage transmission line extends from the energized conductors to other conducting objects such as the ground, towers, vegetation, buildings, vehicles, and people. The strength of the vertical component of the electric field at a height of 1 meter (3.28 feet) is frequently used to describe the electric field under transmission lines. The most important parameters of a transmission line that determine the electric field at 1 meter height are conductor height above ground and line voltage.

For evaluation of electric and magnetic fields from transmission lines it is necessary to calculate the fields for a specific line condition. The National Electrical Safety Code (NESC) states the condition for evaluating electric-field-induced short-circuit current for lines with voltage above 98kV line to ground as follows: conductors are at a final unloaded sag, at a temperature of 120F° (49°C), and at a maximum voltage (NESC, 1990). For the calculation of electric and magnetic fields from the proposed transmission lines the maximum operating voltage, the maximum continuous current, and the minimum conductor clearances at a conductor temperature of 120° F (49° C) were supplied by IPCo. Thus these calculations represent conditions that meet the NESC criteria.

Maximum or peak field values would occur over a small area at midspan where the conductor clearance is lowest. As the location of an electric field profile approaches a tower, the conductor clearance increases, and the peak field decreases. Very close to a tower, the electric field would be reduced considerably due to shielding by the grounded tower. The electric fields at the edge of the right-of-way are not as sensitive to conductor height as is the

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peak field. Computed values at the edge of the right-of-way for any line height are fairly representative of what can be expected all along the transmission line corridor.

Sources of 60 Hz electric and magnetic fields exist everywhere that electricity is used, and levels of these fields in the modern environment vary over a wide range. Electric fields in publicly accessible places range from less than 1 volt/meter (V/m) to over 10 Kv/m. The latter value is typically proximate to a high voltage transmission lines of 500kV or higher voltage.

Numerous measurements of residential electric fields have been reported for various parts of the United States, Canada, and Europe. There has been no systematic approach to sampling homes and measuring electric field exposure. However, area measurements and a few sets of personal exposure measurements are now sufficient to indicate a degree of consistency (Bracken, 1988).

Electric fields from household appliances are localized and decrease rapidly with distance from the source. Local electric fields 1 foot (0.3 meter) from small household appliances are typically in the range of 30 to 60 V/m. At 0.3 meter from an electric blanket, a field of 250 V/m was measured (Sheppard and Eisenbaum, 1977). Stopps and Janischewskyj (1979) reported electric field measurements near 20 different appliances. At 0.3 meter from the devices, fields ranged from 1 to 150 V/m with a mean of 33 V/m. In another survey, measurements 0.3 meter from common domestic and workshop sources yielded fields from 3 to 70 V/m (Deno and Zaffanella, 1982).

The localized fields from appliances are not uniform and care should be taken in comparing them with transmission line fields. In addition, appliance fields may be modified by charge redistribution induced by the presence of conducting bodies.

Florig (1986) performed extensive empirical and theoretical analysis of electric field exposure from electric blankets. Depending on what parameter was chosen to represent intensity of exposure and the grounding status of the subject, the equivalent vertical 60 Hz electric field exposure ranged from 20 to over 3500 V/m. The largest equivalent field corresponds to the measured field on the thorax with the blanket user grounded. The average field on the thorax of an ungrounded blanket-user yields an equivalent vertical field of 960 V/m.

Generally, occupations that are not directly related to high voltage equipment experience electric fields comparable with residential exposures. For example, the average electric field measured in 14 commercial and retail locations in rural Wisconsin and Michigan was 4.8 V/m. (ITT Research Institute, 1984) Median electric field was about 3.4 V/m. These values are about one-third the values in residences reported in the same study. Power-frequency electric fields near video display terminals are about 10 V/m, similar to other appliances (Harvey, 1983).

Using a small 60 Hz dosimeter, Deadman et al. (1988) measured occupational exposures over a one week period for 20 utility workers and 16 office workers. The geometric mean of the weekly exposures during work for the 20 utility workers was 48.3 V/m compared to 4.9 V/m for the office workers. The transmission linemen (n=2, 420 V/m) had the highest geometric

mean exposures. These results are consistent with previous studies that used less sophisticated instrumentation.

Thus, except for the relatively few occupations where high voltage sources are prevalent, electric fields encountered in the workplace are probably similar to residential exposures. Electric fields found in publicly accessible areas near high voltage transmission lines can range up to 12 Kv/m for the highest voltage lines. These levels are considerably higher than the levels found in other public areas.

As expected, electric fields in publicly accessible outdoor areas are related to the proximity of transmission and distribution systems. Electric fields in public buildings appear to be comparable with residential levels.

Magnetic Fields

Magnetic fields can be characterized by the force they exert on a moving charge or on an electrical current. Magnetic field is a vector quantity that is characterized by both magnitude and direction. Electrical currents are sources of magnetic fields.

The uniformity of a magnetic field depends on the nature and proximity of the source, just as the uniformity of an electric field does. Magnetic fields generated by transmission line are quite uniform over distances of a few meters near the ground. However, for small sources such as appliances, the magnetic field decreases rapidly over distances comparable with the size of the device.

The magnetic field generated by currents on transmission line conductors extends from the conductors through the air and into the ground. Because the magnetic field is not affected by nonferrous materials, the field is not influenced by normal objects on the ground under the line. This is in contrast to the electric field, which is essentially vertical near the ground. The most important parameters of a transmission line that determine the magnetic field at 1 meter height are conductor height above ground and the currents in the conductors.

As with electric fields, the maximum or peak magnetic fields occur in areas near the centerline and at midspan where the conductors are the lowest. If more than one line is present, the peak field would depend on the relative electrical phasing of the conductors. The magnetic field at the edge of the right-of-way is not very dependent on line height.

The magnetic field levels associated with the proposed line configurations are generally comparable with fields from the existing 500kV line along a portion of the route and from other 500kV transmission lines as characterized in Chapter 4. The levels at the edge of the right-of-way are comparable to the fields measured one foot (0.3 meter) away from some small appliances such as hair dryers, electric shavers, mixers, and portable heaters. (Gauger, 1985)

Transmission lines are not the only source of magnetic fields; as with 60 Hz electric fields, 60 Hz magnetic fields are present throughout the environment of a society that relies on electricity as a principal energy source.

Several investigations of residential fields have been conducted with the most extensive being in conjunction with epidemiological studies. Short-term measurements of magnetic fields in 483 residences in the Denver area resulted in mean fields of 0.76 Mg (standard deviation (SD) - 0.79 Mg) under low-power conditions, that is, with all appliances and lights off (Savitz, 1987).

Kaune et al. (1987) reported on 24-hour magnetic field measurements made in 43 residences in the Seattle area. The mean for these measurements was 1.0 Mg (median = 0.6 Mg, standard deviation = 1.2 Mg). The magnetic field data demonstrated a diurnal variation that was coincident with utility loads: peak values at 8 a.m. and 6-7 p.m. and minimum values very early in the morning. No correlation with individual power consumption was observed. The Denver and Seattle studies both concluded that the predominant sources of residential magnetic fields are external and that ground return currents could be an important source of residential magnetic fields.

Magnetic fields from appliances are localized and decrease rapidly with distance from the source. Localized 60 Hz magnetic flux densities have been measured near approximately 100 household appliances such as ranges, refrigerators, electric drills, food mixers, and shavers (Gauger, 1985). Ninety-five percent of the levels at a distance of 1.5 meter were less than 1 Mg. Devices that use light-weight, high-torque motors with little magnetic shielding exhibited the largest fields. These included vacuum cleaners and small handheld appliances and tools. Microwave ovens with large power transformers also exhibited relatively large fields. Electric blankets have been a much studied source of magnetic field exposure because of the time they are used and because of the close proximity to the body. Florig and Hoburg (1988) estimated that the average magnetic field in a person using an electric blanket was 15 Mg and the maximum field could be 100 Mg.

In a domestic magnetic field survey, Silva et al. (1988) measured fields near different appliances at locations typifying normal use (e.g., sitting at a typewriter or standing at a stove). Specific appliances with relatively large fields were:

- can openers (n = 9) with typical fields ranging from 30 to 225 Mg and a maximum value up to 2.7 G
- shavers (n = 4) with typical fields from 50 to 300 Mg and maximum fields up to 6.9 G
- electric drills with typical fields from 56 to 190 Mg and maximum fields up to 1.5 G.

Although studies of residential magnetic fields have not all considered the same independent parameters, a consistent characterization of residential magnetic fields can be seen from the data.

(1) External sources play a large role in determining residential magnetic field levels. Transmission lines, when nearby, are an important external source. Ground currents in proximity to the house appear to represent a significant source of magnetic field. Distribution lines, per se, unless they are quite close to a residence, do not appear to be a traditional distance-dependent source.

(2) Homes with overhead electrical service, appear to have higher average fields than those with underground service.

(3) Appliances represent a localized source of magnetic fields, which can be much higher than average or area fields. However, fields from appliances approach area levels at distances greater than one meter from the device.

Magnetic fields in commercial and retail locations are comparable with those in residences. As in the case of appliances, certain equipment or machines can be a local source of higher magnetic fields. Utility workers who work close to transformers, generators, cables, transmission lines, and distribution systems clearly experience high fields. Other sources of fields in the workplace include motors, welding machines, computers, and video display terminals.

Possible effects associated with the interaction of electric and magnetic fields from transmission lines with people on and near a right-of-way fall into two categories: short-term effects that can represent a nuisance and potential long-term health effects. Only short-term effects are discussed here.

Short-term effects due to transmission line electric fields are associated with perception of induced currents and voltages or perception of the field. Induced current or spark discharge shocks can be experienced under certain conditions when contacting objects in an electric field. Magnetic fields associated with transmission and distribution systems can induce voltage and current in long conducting objects that are parallel to the transmission line.

A fence, irrigation pipe, pipeline, electrical distribution line, or telephone line forms a conducting loop when it is grounded. The earth forms the other portion of the loop. If only one end of the fence is grounded then an induced voltage appears across the open end of the loop. The possibility for a shock exists if a person closes the loop at the open end by contacting both the ground and the conductor.

Corona

Corona is the partial electrical breakdown of the insulating properties of air in the vicinity of the conductors of a transmission line. Energy and heat are dissipated in a small volume near the surface of the conductors. Part of this energy is in the form of small local pressure changes that result in audible noise. Corona-generated audible noise can be characterized as a hissing cracking sound that under certain conditions is accompanied by a 120 Hz hum.

Corona-generated audible noise is of concern primarily for contemporary lines operating at voltages of 345kV and higher during foul weather. The conductors of high voltage transmission lines are designed to be corona free under ideal conditions. However, slight variations and irregularities in the conductor surface cause higher electric fields near the conductor surface, and corona occurs. The most common source of enhanced electric fields at the conductor surface are water droplets on or dripping off the conductors. Therefore, audible noise from transmission lines is generally a foul weather, (i.e., wet conductor, phenomenon). Wet conductors can occur during periods of rain, fog, snow, or icing. Along the alternative routes of the proposed SWIP transmission line such conditions are expected to occur infrequently (less than five percent of the time). During fair weather, insects and dust on the conductor can also serve as sources of corona. The proposed line has been designed with three subconductors per phase to minimize corona.

Along most of the proposed line route there would be only slightly perceivable changes in levels of audible noise during foul weather. Along sections of the proposed route where low voltage or direct current lines exist, there would be an increase in the perceived noise above that from the existing line during periods of foul weather. However, the noise levels from the proposed line would be below levels identified to cause interference with speech or sleep. The audible noise from the SWIP transmission line would be below EPA guideline levels. Therefore, corona-generated audible noise from the proposed line is expected to be minimal.

Corona on transmission line conductors can also generate electromagnetic noise in the frequency bands used for radio and television signals. Interference with electromagnetic signals by corona-generated noise is generally associated with lines operating at voltages of 345kV or higher. This is especially true of interference with television signals. The three-conductor bundle design of the proposed 500kV line is expected to minimize corona generation and thus keep radio and television levels at acceptable levels.

Audible Noise

Audible noise represents an unwanted sound from a transmission line, transformer, airport, vehicle traffic, etc. Sound is a pressure wave caused by a sound source vibrating or displacing air. The ear converts the pressure fluctuations into auditory sensations. Audible noise from a source is superimposed on the background or ambient noise that is present before the source is introduced.

Humans respond to sounds in the frequency range of 16 to 20,000 Hz. The response of the human is dependent on frequency with the most sensitive range being roughly between 2,000 and 4,000 Hz. The frequency-dependent sensitivity is reflected in various weighting scales for measuring audible noise. The A-weighted scale weights the various frequency components of a noise in approximately the same way that the human ear responds. The A-weighted scale is generally used to measure and describe levels of environmental sounds from vehicles or occupational sources. The A-weighted scale is also used to characterize transmission line noise. Sound levels measured on the A-scale are expressed Db(A) or dBA.

Audible noise levels and, in particular, corona-generated audible noise vary in time. In order to account for fluctuating sound levels, statistical descriptors have been developed for environmental noise. Exceedance levels, or L levels, refer to the A-weighted sound level that is exceeded for a specified percentage of the time. Thus, the L5 level refers to the noise level that is exceeded only five percent of the time. L50 refers to the sound level exceeded 50 percent of the time and corresponds to the median level. Sound-level measurements and predictions for transmission lines are often expressed in terms of exceedance levels with the L5 level representing the maximum level and the L50 level representing a median value.

There are no noise codes applicable to transmission lines in Idaho or Nevada. The EPA has established a guideline of 55 DBA for the annual average day-night level in outdoor areas (EPA, 1978). In computing this value, a correction (penalty) is added to nighttime noise. The noise levels of the proposed line fall below the EPA guideline.

Corona-generated audible noise can be characterized as a hissing cracking sound that under certain conditions is accompanied by a 120 Hz hum. Corona-generated audible noise is of concern primarily for contemporary lines operating at voltages of 345kV and higher during foul weather (refer to previous section on corona).

The calculated foul weather corona noise levels for the proposed line are comparable with the calculated levels for the existing lines except for the case of low-voltage alternating current (69kV) and direct current lines. The difference in noise level at the edge of the right-of-way would be barely discernible to the human ear except for the aforementioned low-voltage corridors.

CHAPTER 3

Radio and Television Interference

In the United States, electromagnetic interference from electrical transmission systems is governed by the Federal Communications Commission (FCC) Rules and Regulations presently in existence (FCC, 1988). A power transmission system falls into the FCC category of "incidental radiation device" which is defined as "a device that radiates radio frequency energy during the course of its operation although the device is not intentionally designed to generate radio frequency energy". Such a device "shall be operated so that the radio frequency energy that is emitted does not cause harmful interference. In the event that harmful interference is caused, the operator of the device shall promptly take steps to eliminate the harmful interference." For purposes of these regulations, harmful interference is defined as "any emission, radiation or induction which endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radio communication service..."

Radio reception in the AM broadcast band (535 to 1,605 kilohertz) is most often affected by corona-generated electromagnetic interference (EMI). FM radio reception is rarely affected. Generally, only residences very near to transmission lines can be affected by RI.
The RI levels predicted for the proposed 500kV line are comparable with the RI levels predicted for the existing corridors with the exception of those with low voltage (≤138kV) or DC lines.

Corona-caused TVI occurs during foul weather and is generally of concern for transmission lines with voltages of 345kV or above and only for receivers within about 600 feet of a line. Because of the multiple-conductor design of the proposed line, corona-generated TVI would be comparable with or below that on other 500kV lines. The levels for the proposed 500kV line are at or below levels predicted for the existing corridors except in those corridors with low voltage (≤138kV) or direct current lines.

There is a potential for interference with television signals at locations very near either the existing line or the proposed SWIP alternatives in fringe reception areas. However, several factors reduce the likelihood of occurrence. Corona-generated TVI occurs only in foul weather, consequently signals would not be interfered with during the majority of time characterized by fair weather. Since television antennas are directional, the impact of TVI is related to the location and orientation of the antenna relative to the transmission line. If the antenna is pointed away from the line, then TVI from the line would affect reception much less than if the antenna is pointed towards the line.

Other forms of TVI from transmission lines are signal reflection (ghosting) and signal blocking caused by the relative locations of the transmission structure and the receiving antenna with respect to the incoming television signal.

Interference with television reception can be corrected by any of several approaches:

- improving the receiving antenna system
- installing a remote antenna
- installing an antenna for TV stations less vulnerable to interference
- connecting to an existing cable system
- installing a translator (Cf. Loftness, 1977).

Typical transmission line engineering practice is to design all lines to be as free from corona and other sources of interference as possible. Radio and television interference complaints would be recorded and investigated by IPCo, and corrective measures taken as required. Electromagnetic compatibility measurements would be taken before and after the line is in service to determine if there has been any degradation in communication quality.

CULTURAL ENVIRONMENT

Cultural Resources

Introduction

Cultural resources include cultural properties and traditional lifeway values. Cultural properties are locations of past human activity, occupation or use, and include archeological, historic, or architectural sites, structures, or places with important public and scientific uses. They may include sites or places of traditional cultural or religious importance for specific

social or cultural groups. Traditional lifeway values are useful in the maintenance of a specific social or cultural group's religious beliefs, cultural practices, or social interaction. These values are abstract and nonmaterial (BLM Manual 8100).

The NEPA (§101[b][4]) establishes a federal policy of preserving not only the natural aspects, but also the historic and cultural aspects of our national heritage when undertakings regulated by federal agencies are planned. Implementing regulations (40 CFR Part 1502.16[g]) issued by the CEQ stipulate that the consequences of federal undertakings on historic and cultural resources be analyzed.

Additional requirements for protecting cultural resources are identified in the National Historic Preservation Act (NHPA) of 1966, as amended (80 Stat. 915, 94 Stat. 2987, 16 USC 490), and the Archaeological Resources Protection Act (ARPA) of 1979 (93 Stat. 721, 16 USC). In addition, the American Indian Religious Freedom Act of 1978 (P.L. 95-431) reaffirms the rights of Native Americans to believe, express, and exercise their traditional religion and requires that all federal agencies take into account the effects of their projects on traditional Native American religious practices. The Native American Graves Protection Act of 1990 also expressly provides for the protection of Native American graves, funerary objects, sacred objects, and items of cultural patrimony and gives Native American groups priority in the ownership and control of such human remains and artifacts.

Methods

Regulations for "Protection of Historic Properties" (36 CFR Part 800), which primarily implement Section 106 of the NHPA, define the key regulatory requirements. These regulations define a process for consulting with State Historic Preservation Officers (SHPOs), the federal Advisory Council on Historic Preservation (ACHP), and other interested parties to ensure that historic properties are duly considered as federal projects, are planned and implemented. The steps in this process are:

- identifying and evaluating historic resources that may be affected by the proposed undertaking
- assessing the potential effects of the undertaking on significant historic properties
- consulting with the SHPOs, ACHP, and other interested persons to determine ways to avoid or reduce effects on historic properties
- providing the ACHP a reasonable opportunity to comment on the proposed undertaking and its effects on significant historic properties
- proceeding with the undertaking under the terms of a Memorandum of Agreement or in consideration of ACHP comments involving all historic properties

The general thrust of this process is to establish a process for identifying impacts of development on cultural resources and create opportunities for adopting measures to avoid, minimize, mitigate, or accept such impacts. It is not a project vetoing regulatory context, as much as negotiating one. The studies undertaken for this EIS constitute an important initial step in this process, which will continue to be pursued during subsequent phases of project implementation.

Within the regulatory context of historic preservation, cultural resources are considered significant if they are determined eligible for inclusion in the National Register of Historic Places (NRHP). Historic cultural properties are National Register eligible if they are significant in American history, architecture, archaeology, engineering, and culture. They must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and meet at least one of four criteria:

(a) are associated with events that have made a significant contribution to the broad patterns of our history

(b) are associated with the lives of persons significant in our past

(c) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant distinguishable entity whose components may lack individual distinction

(d) have yielded, or may be likely to yield, information important in prehistory or history (36 CFR Part 60.4)

Results

In implementing these definitions it has become common practice to delineate three basic categories of resources: (1) prehistoric resources, (2) ethnographic sites, and (3) historic sites. As our nations heritage, these resources provide an important means of building a perspective on our modern lives.

Prehistoric resources predate the era of written records, which in the project area began with exploration by Europeans. Prehistoric resources are archaeological sites that reflect more than 10,000 years of occupation by numerous American Indian cultures. Prehistoric archaeological sites are abundant in the American West. They range from ruins now preserved as national monuments to small, simple scatters of chipped stone artifacts or broken clay pots. Inventories of 50,000 recorded sites per state are common, and increased levels of survey intensity indicate that literally hundreds of thousands more unrecorded and unevaluated archaeological sites dot the landscape.

Ethnohistoric resources (or traditional cultural properties) can be some of the most sensitive cultural resources for project planners to consider. The ethnohistoric era refers to the time when native ethnic groups were first described and documented by Europeans. Many

ethnohistoric resources have special significance for contemporary American Indian groups because of their former or continuing occupation or use of given localities. Such resources are by no means limited to current Indian reservation boundaries and, in many cases, there is very little physical evidence of these traditional cultural properties. Project impacts on such resources can be difficult to mitigate because the resources are often considered sacred by Indian communities. Mitigation measures, therefore, must be formulated in consultation with affected Native American groups.

Historic resources are some of the best documented cultural resources in the project area. Most cities, as well as smaller towns and rural areas, have a variety of old buildings listed on the National Register of Historic Places or on similar state registers. Other than old buildings, historic resources include ghost towns, mines, historic ranches, and a variety of structures, roads, and trails. Some historic resources that have disintegrated into archaeological sites are characterized by foundations, artifact scatters, or buried features.

Cultural History Overview

The project area has been occupied for thousands of years. This section briefly summarizes what is known about this long history of human use of the project area, which is situated primarily within the eastern Great Basin cultural area. The northern end, however, is in the northeastern Great Basin rim region and the extreme southern end is in an area with strong influence from Colorado Plateau groups. The culture history summarized in the section is primarily based on research in eastern Nevada. Variant cultural chronologies for peripheral areas are discussed in the technical report (Rogge and Woods 1992.)

Prehistory - Four prehistoric cultural stages, pre-Archaic, Archaic, Formative, and Numic, are represented in the study area. Generally, the pre-Archaic cultural stage spans the period of 13,000 to 8,000 BC, the Archaic dates from about 8,000 BC to AD 500 and the Formative stage, where present, lasts from about AD 500 to 1300. The Numic period, which may overlap with the Formative, begins at about AD 1200 to 1300 and ends with historic contact. Projectile point morphology, which reflects modifications in subsistence strategies and weapon systems, is the primary basis for distinguishing these stages.

The pre-Archaic cultural stage is also referred to as Lithic stage, Paleo-Indian period, or Early Big Game Hunting period, and farther to the west as the Western Pluvial Lakes tradition. Material remains of this early cultural stage are primarily large, well made lanceolate spear points. Fluted spear points give way to unfluted forms by about 8,000 BC. When found in stratified deposits, these projectile point styles are often associated with now extinct species of mammoth, bison, camel, mountain sheep, horse, and sloth. Although the vast majority of these resources are surface finds that lack depositional context, some pre-Archaic cave sites also are known.

The Archaic period is marked by the replacement of the larger lanceolate points with large side-notched and indented stemmed forms as well as the appearance of grinding implements. This change in projectile point morphology is generally acknowledged to be the result of the development of the atlatl (throwing stick) and dart weapon system. Archaic projectile point

types include Humboldt, Northern Side-notched, and Pinto series points. After 2,000 BC, the Elko series projectile points become dominant. Grinding implements are found in Archaic era sites and probably reflect the increased importance of native plant foods in the subsistence economy.

The early Archaic era is characterized by lake side cave and shelter sites with lacustrine resources serving as the primary subsistence base. During the middle and late Archaic, settlement shifted to upland habitats where piñon became an important resource. Lake side sites were almost exclusively abandoned by the late Archaic. Excavations in caves and shelter sites have yielded much of the known data for the Archaic, but the majority of Archaic period, as well as Paleo-Indian stage sites consist of temporary camps evidenced by surficial chipped lithic scatters.

Two contemporaneous Formative cultures occupied portions of the study area. Where formative cultures were not present, Archaic groups continued to occupy the region. The Fremont inhabited the central portions of the project area while the Virgin Anasazi occupied the western Colorado Plateau in the southern end of the project area. Both engaged in agricultural pursuits and manufactured distinctive ceramics. Fremont architectural remains are dominated by semi-subterranean pit houses while the Virgin Anasazi built both pit houses and above ground masonry structures.

At about AD 1,200 to 1,300, the Formative and Archaic disappear from the archaeological record, being replaced by Numic speaking groups. The Numic mobile hunting and gathering lifeway is reminiscent of Archaic subsistence strategies. Diagnostic Numic artifacts include brownware pottery and Desert Side-notched arrow points. Numic groups continued to occupy the region and were present at the time of contact with Euro-Americans during the 18th and 19th centuries, marking the end of the prehistoric era.

Ethnohistory - During the ethnohistoric era, the study area was occupied by the Northern Shoshone, Bannock, Western Shoshone, Pahvant Ute, and Southern Paiute. Generally speaking, the Northern Shoshone and Bannock inhabited the project area in southern Idaho. The Western Shoshone ranged through eastern Nevada and northwestern Utah. The central portion of Utah was occupied by the Pahvant Ute while the Southern Paiute inhabited southwestern Utah and southern Nevada.

All of these groups speak various Numic dialects that belong to the Uto-Aztecan linguistic family. The Northern and Western Shoshone speak a Central Numic dialect. Western Numic is the dialect spoken by the Northern Paiute and Bannock. Both the Pahvant Ute and Southern Ute speak a Southern Numic dialect.

All of these groups led similar lifestyles with some localized variations. Mobile hunting and gathering was the primary subsistence strategy, although the Southern Paiute practiced limited agriculture. Seasonal rounds generally consisted of single households or extended families hunting and gathering during the spring and summer with groups of up to 10 households congregating for fall hunts and sharing resources through the winter.

The ethnohistoric groups commonly sought shelter from the elements in caves and rockshelters or constructed conical structures of wood and brush. Less formal shelters such

as lean-tos and sun shades were commonly built during the summer. Skins, particularly rabbit fur, and grass and woven vegetable fiber were used for clothing. Baskets served as primary vessels. Ceramic technology was known, but use of aboriginal ceramics waned after contact with Euro-Americans. With the exception of the Northern Shoshone, none of these groups acquired enough horses to make fundamental changes in their subsistence strategies. The Northern Shoshone, however, adopted a number of Plains cultural traits along with the horse, such as the tipis, buffalo robes, and buckskin clothing.

History - After the arrival of Europeans in the New World, portions of the study area were claimed by Spain, Great Britain, France, Mexico, and Canada, as well as the United States. The earliest European exploration was led by Escalante who skirted the eastern margin of the study area in Utah. After the famous Lewis and Clark Expedition to the Pacific Coast in 1804-1806, fur trappers and mountain men were lured to the Rocky Mountains until the decline of fur trading in about 1840.

Following routes established by the fur traders and missionaries, emigrants began to trickle through the region by the early 1840s. Major overland routes were the Oregon Trail, California Trail, Overland Trail, and Old Spanish Trail/Mormon Road. What began as a trickle became a torrent after the discovery of gold in California. From 1840 to 1848 nearly 3,000 people made the overland journey to California. Between 1849 and 1860 nearly 300,000 transcontinental travelers had made the trek and these routes later served, with some variation, as the Pony Express and stagecoach routes.

During the late 1840s Mormon settlers arrived in the region and began to establish towns in Utah, along the Wasatch Front and Cache Valley. Later a "Mormon Corridor" was established to the Pacific following the Old Spanish Trail, and Mormon communities were established along this route.

Settlement in eastern Nevada is largely associated with the discovery of various ore deposits. From about 1850, to the turn of the century, numerous discoveries were made and mining districts were established in Kit Carson, Egan Canyon, Robinson, Ely, White Pine, Meadow Valley, Pahranagat Valley, and Ferguson. Numerous settlements were founded at mining camps or in nearby locations to support mining activities, including Contact, Cherry Creek, McGill, Ruth, Kimberly, Riepetown, Hamilton, Ely, Osceola, Bristol Wells, Pioche, Hiko, and Delamar.

The route of the first transcontinental railroad passes through the study area. Generally following the route of the California Trail, the railroad was completed as a joint venture of the Central Pacific and Union Pacific in 1869. A second transcontinental route (Western Pacific) was completed in 1907. Other early railroads through the study area include the Oregon Short Line, Nevada Northern, and Utah Central.

Just as the early transcontinental railroads followed the early trails so the early transcontinental highways parallel these corridors. In general, the Lincoln Highway follows the Overland Trail, the Victory Highway parallels the California Trail, and the Arrowhead Interstate 15 follows the general corridor of the Old Spanish Trail/Mormon Road.

Very little of the study area is arable without irrigation. Consequently most early farming in the study area was restricted to the Columbia Plateau, Snake and Cache river basins to the north, along the Wasatch Front to the east and along the major water courses on the Colorado Plateau to the south. Ranching was somewhat less restricted and practiced throughout most of the study area, except for the Great Salt Lake Desert and other areas devoid of vegetation. Both cattle and sheep ranches were common.

The federal government has been directly involved in the study area since the mid 19th Century. Various expeditions by the Corps of Topographic Engineers conducted surveys for the transcontinental railroad routes. Scientific surveys were conducted by the United States Geological Survey. The United States Army was deployed to protect settlers and transportation routes from raids by Native Americans. Later federal agencies took an active role in controlling grazing, established forest reserves, and built water reclamation projects. During World War II, two Japanese-American relocation camps were established at Minidoka and Topaz. Various military bases are still present in the study area. The vast majority of land within the study area is still administered by the federal government.

Regional Studies

The most sensitive cultural resources in the study area were inventoried in conjunction with a regional study designed to identify alternative transmission line corridors and related facility siting areas. A brief overview of the cultural history of the area was prepared for the regional study and Native American groups were contacted to solicit their comments.

Information was tabulated for 462 of the most sensitive cultural resources within the study region. Data about approximately 16,000 additional archaeological sites recorded within the regional study area were obtained from the Intermountain Antiquities Computer System. Although the location of most of the sites could be plotted, it is impossible to easily abstract information about site types and sensitivities from the computerized files. The distribution of the sites undoubtedly reflects where surveys have been completed rather than where sites are and are not located. It is very likely that five to ten times as many sites remain to be inventoried. Therefore, the more specific information compiled on the 462 manually inventoried sites was relied on during the initial phases of study.

Phase I Sensitivity Modeling - The 462 inventoried resources were divided into three classes of sensitivity: (1) exclusion areas, (2) avoidance level 1, and (3) avoidance level 2. The classification into these categories was based on several factors including legal protection that would affect the ability to license the proposed project, perceived resource sensitivity, and cost to mitigate potential effects. Sensitivity ratings and the numbers and types of sites assigned to these sensitivity classes are summarized in the technical report.

Only 12 of the 462 inventoried resources (or less than three percent of the inventory) were classified as exclusion zones. Approximately 65 percent of the inventory (300 sites) were assigned to the avoidance level 1 category. The remaining 150 sites were assigned to the avoidance level 2 category.

All of the exclusion zones and most of the other avoidance category resources were avoided by the alternative corridors selected for further consideration. Only ten of the 300 avoidance level 1 sites and 11 of the avoidance level 2 sites are within the two-mile-wide alternative corridors. Therefore, the regional study resulted in minimizing potential adverse effects on the most significant cultural resources recorded within the project area.

Alternative Corridor Studies

The focus of the Phase II corridor studies was to identify recorded resources and evaluate their sensitivity. A model to predict sensitivities in uninventoried areas was also developed. Site data collected during Phase I were augmented by reviewing and compiling site file information at the SHPOs in Idaho, Nevada, and Utah, as well as from BLM Boise and Burley Districts in Idaho, the Elko, Ely, and Las Vegas Districts in Nevada, and the Richfield District in Utah. Several other agencies were contacted but it was determined that their files were unlikely to yield additional information.

The primary goal of the file search was to collect site location and site form data for all sites recorded within the two-mile-wide corridors centered on each alternative link centerline. Siting areas for ancillary facilities, such as substations and microwave communication sites, were studied as well. The Native American contact program initiated in Phase I was continued in an attempt to identify additional ethnohistoric sites that might be of significance to local Native American communities.

The Phase II results indicate that about 1,427 cultural resources have been recorded within the two-mile-wide corridors along the alternative links, and within the ancillary facility siting areas. Prehistoric resources comprise about 83 percent of the sites. The majority of these are isolates and lithic scatters, but more complex habitation sites are also included in the inventory. Ethnohistoric resources constitute only about 2.5 percent of the sites, but most of these are large areas whose boundaries are only vaguely defined. Specific features having archaeological or traditional cultural values have not been identified within these zones, but their documented use indicates such sites could be present. Historic resources constitute about 13 percent of the identified sites. Many types of historic sites are included in the inventory. There are some complex types such as historic trails and town sites, but isolated artifacts and trash scatters are the most common type. The remaining 1.5 percent of the inventory is comprised of sites that contain both prehistoric and historic components, or whose site classes or types are unrecorded. In the following sections, the resources recorded along each alternative route are briefly described.

Phase II Sensitivity Modeling - The Phase II sensitivity model was developed to reflect the varying importance of the different site types within the inventory. Five sensitivity categories, ranging from low to very high, were defined based on site class and site type. The very highly ranked resources included properties listed on the National Register of Historic Places, prehistoric, ethnohistoric and historic sites with human remains, and traditional cultural properties regarded as sacred. Resources rated as having high sensitivities include antelope traps, well-known rock shelter and rock art sites, major historic trails, roads, and railroads, and complex historical sites with standing architecture, such as

town sites. Moderate high sensitivity was assigned to prehistoric habitation sites, such as rock shelters, campsites, and villages, and relatively complex historic sites such as homesteads, ranches, railroad sidings, and dams. Site types assigned a moderate sensitivity include prehistoric artifact scatters, quarries, and rock art sites, ethnohistoric habitation and use areas, and historic trash scatters, dumps, and relatively simple structures such as cisterns, mining prospects, building foundations, and ditches. Low sensitivity was assigned to prehistoric isolates and rock features, and small, partially intact historic features such as minor roads, telegraph lines, camp sites, water tanks, railroad beds, powder magazines, and rock alignments.

Because the majority of the study corridors have not been systematically inventoried for cultural resources, a component of the model was developed to project where densities of unrecorded sites are likely to be high. These projections are based on the commonly held assumptions that prehistoric sites are encountered in higher densities near reliable water sources and within piñon-juniper vegetation communities. Ethnohistoric and historic sites were in effect modeled in conjunction with development of the Phase II inventory, because unrecorded but potential site areas were recognized as a result of literature review and from comments of knowledgeable agency resource specialists.

Of the 1,427 previously recorded cultural resources in the Phase II study areas, only 38 localities representing approximately 100 resources were assigned a high or very high sensitivity rating. Historic resources in this group include such sites as the Minidoka Japanese-American Relocation Center, a historic segment of the Nevada Northern Railroad, segments of the Oregon, California, and Hastings Cutoff trails, Kelton road, and Old Spanish Trail/Mormon Road, the Pony Express/Lincoln Highway and other Pony Express routes, the Osceola Ditch, and various historic cemeteries, burials, residences, and town sites. Prehistoric sites given a high or very high rating include the Deseret petroglyph panel, a Paleo-Indian campsite, burials, antelope traps, and rock shelter sites with rock art. The Humboldt, Wells and City of Rocks archaeological districts containing both historic and prehistoric sites are included as well.

In addition to recorded sites, 20 predicted sensitivity zones, areas with a high probability for unrecorded prehistoric sites, were identified. The majority of these are small areas, but a large area in the Deep Creek drainage in Idaho has been identified as highly sensitive.

During the Phase II studies, selected alternative links were combined to form various alternative routes. The cultural resources along each alternative are characterized in the following paragraphs.

Alternative Routes - Midpoint to Dry Lake

All of the Midpoint to Dry Lake alternative routes cross portions of four major historic trails: the Oregon, the Hastings Cutoff, the California, and the Pony Express route. The City of Rocks archaeological district also is within the two-mile-wide corridor as all the alternatives pass the district, but direct impacts can be avoided. All routes, except Route F, cross the Minidoka Japanese-American Relocation Center and all except Route A cross one or more

antelope trap sites. In addition, the Route A, C, and G corridors include a historic town site and a historic cemetery. The corridor for Route F includes a historic town site, cemetery, four residences, and a prehistoric campsite with burials.

The Midpoint to Dry Lake alternative routes include some of the predicted sensitivity zones as well. All alternatives except Route F cross the large Deep Creek high sensitivity zone. All but Route B and Route G cross the Dry Canyon Spring zone, but Routes B and G both cross the Antone and Telegraph Creek zones. Alternative Routes C and F cross the Texas Spring Canyon zone. Route D is the only one to cross the Thousand Springs Valley, which has pockets of predicted high sensitivity.

Route A

A total of 463 cultural resources have been identified in the two-mile-wide corridor of Route A. About 85 percent of them are prehistoric sites, 3 percent are ethnohistoric, and 12 percent are historic sites. Twelve of these resources have been assigned high or very high sensitivity ratings. In addition 3 predicted high sensitivity zones have been projected by the modeling procedures.

A total of 72 cultural resources were plotted along Route A from the Midpoint Substation to the Jackpot area. Almost 60 of these were prehistoric sites, 10 were historic, and ethnohistoric habitation sites are located near Rock Creek and in the Jackpot vicinity. The resources with the highest ranked sensitivity were the Minidoka Japanese-American Relocation Center and the Oregon Trail.

Between Jackpot and the Windermere Hills about 30 prehistoric sites and 5 historic sites have been recorded along Route A. This segment of the route crosses the Thousand Springs Valley, as well as an area near Jackpot. Both these localities are identified as ethnohistoric habitation sites. The highest sensitivity sites along this segment of the route are the California Trail, the California/Immigrant Trail, and the historic town of Contact.

Between the Windermere Hills and Interstate 80, the Route A corridor contains 12 resources including the alignment of the historic Central Pacific Railroad.

Between Interstate 80 and Dolly Varden, the Route A corridor includes about 20 more recorded cultural resources with the majority, 13, being historic. A single ethnohistoric area is crossed in the vicinity of Oasis. The resources rated as most sensitive along this segment of the corridor are the Hastings Cutoff, the Shafter town site, and a cemetery.

From Dolly Varden to North Steptoe substation siting area, 23 more sites have been recorded within the corridor, 20 are prehistoric sites, and 1 is historic. Two ethnohistoric areas, a habitation area in Steptoe Valley and an exploitation area in the Schell Creek Range, are also crossed by the corridor. None are rated as highly sensitive.

From Steptoe to the Robinson Summit area, 26 resources have been recorded along Route A; 17 are prehistoric, 4 are historic, and 3 are general ethnohistoric habitation areas (Steptoe

Valley, Egan Range, and Butte Valley). The resource ranked as most sensitive is the Pony Express/Lincoln Highway alignment.

From Robinson Summit to Dry Lake more than 275 resources have been recorded along Route A. About 245 of these are prehistoric archaeological sites, approximately 20 are historic, and 7 are ethnohistoric areas. The most sensitive of these resources is the City of Rocks archaeological district.

Route B

A total of about 483 cultural resources have been identified in the two-mile-wide corridor along Route B. Of these, 87 percent are prehistoric sites, 4 percent are ethnohistoric resources, and 10 percent are historic sites. Ten of these have been assigned high or very high sensitivity and 4 high sensitivity zones have been projected by the modeling procedures.

The alignment for Route B is the same as Route A from Midpoint Substation to Jackpot. From Jackpot to the Windermere Hills area, Route B includes almost 55 recorded resources, that is about twice as many as along Route A. These include 45 prehistoric sites, 3 historic sites, and 2 ethnohistoric areas (Trout Creek and Thousand Springs). Route B crosses the California Trail in this area as does Route A. Another resource rated as particularly sensitive in this portion of Route B is an antelope trap, a relatively rare type of archaeological site.

From the Windermere Hills to Interstate 80, Route B contains 16 recorded resources, including 15 prehistoric sites and the alignment of the historic Central Pacific Railroad, also crossed by Route A. From Interstate 80 south to the North Steptoe substation siting area, the Route B corridor contains approximately 40 recorded resources (in contrast to about 45 along the Route A counterpart to this segment of Route B). About 25 of these are prehistoric archaeological sites, 7 are historic sites, and 5 are ethnohistoric areas (Goshute Mountain/Toano Range, Antelope Range, Antelope Valley, Steptoe Valley, and Schell Creek Range).

A short segment of Route B is again coincident with Route A (Links 261 and 270) where approximately a dozen cultural resources are recorded. Route B then diverges to the west of Route A into the Robinson Summit area. Route B includes approximately two dozen resources in this area, which is very similar to the Route A tallies. One of the most sensitive resources along Route B in this area is the Pony Express/Lincoln Highway alignment, just as along Route A. In addition, Route B crosses a small portion of another Pony Express Route.

From the Robinson Summit substation Site south to the Dry Lake substation site, Routes A and B are identical.

Route C

Route C is a combination of the route segments of Routes A and B. From the Midpoint Substation to Interstate 80, Route C is identical to Route B, and from Interstate 80 south to the Dry Lake substation site, Route C is identical to Route A.

A total of about 479 cultural resources have been identified in the two-mile-wide corridor along Route C. Approximately 86 percent of these are prehistoric sites, 3 percent are ethnohistoric, and 11 percent are historic sites. Ten of these resources have been assigned high or very high sensitivity. In addition 4 high sensitivity zones have been projected by the modeling procedures.

Route D

A total of 522 cultural resources have been identified in the two-mile-wide corridor along Route D. Of these, 83 percent are prehistoric sites, 3 percent are ethnohistoric sites, and 14 percent are historic sites. Eleven of these have been assigned high or very high sensitivity, and 4 high sensitivity zones have been projected by the modeling procedures.

Route D is identical to Route A from the Midpoint Substation to north of the Windermere Hills area. From there to the Dolly Varden area, it diverges to the west. In this area, Route D includes more than 80 recorded resources (in contrast to less than half that number along Route A). More than 50 of the Route D sites in this area are prehistoric, and about 25 are historic. The most sensitive resources in this area include the California Trail and the Hastings Cutoff, as along Route A, and also a historic railroad town and an antelope trap (but it does avoid the Shafter town site and a cemetery encountered along the Route A corridor). From Steptoe south to the Dry Lake substation site, Route D is identical to Route A.

Route E

Route E is a combination of Routes A and B. From the Midpoint Substation to Interstate 80, Route E follows the Route A corridor. From Interstate 80 south to the North Steptoe substation site, Route E is identical to Route B, and from the North Steptoe substation site on south to Dry Lake substation site, Route E is the same as Route A.

A total of approximately 458 cultural resources have been identified in the two-mile-wide corridor along Route E. About 85 percent of these are prehistoric sites, 4 percent are ethnohistoric localities, and 11 percent are historic sites. Ten of these resources have been assigned high or very high sensitivity, and 3 high sensitivity zones have been projected by the modeling procedures.

Route F

A total of 586 cultural resources have been identified in the two-mile-wide corridor along Route F. Of these, 87 percent are prehistoric sites, 3 percent are ethnohistoric locales, and 10 percent are historic sites. Fifteen of these resources have been assigned high or very high sensitivity, and 2 high sensitivity zones have been projected by the modeling procedures.

Route F is the only alternative that goes west from Midpoint Substation. It includes almost 160 recorded resources along those links that diverge from Route A at the northern end of the project area. (Only about 40 resources are recorded along Route A in this area.) Almost 140 of these are prehistoric, 14 are historic, and 3 ethnohistoric areas are crossed (Lower Salmon Falls, the West Bank of the Snake River, and Salmon Falls Creek). The most sensitive resources in this area include four houses listed on the National Register of Historic Places, the Oregon Trail, the historic Kelton Road, and a cluster of sites along the Snake River, which includes two sites where prehistoric burials have been recorded. (The high sensitivity sites along the counterpart portion of Route A include the Oregon Trail and the Minidoka Japanese-American Relocation Camp.) From the Jackpot vicinity to I-80, Route F is identical to Route B. From I-80 South to the Dry Lake substation site, Route F is identical to Route A.

Route G

A total of 483 cultural resources have been identified in the two-mile-wide corridor along Route G. About 83 percent are prehistoric sites, 4 percent are ethnohistoric resources, and 13 percent are historic sites. Thirteen of these resources have been assigned high or very high sensitivity, and 3 sensitivity zones have been projected by the modeling procedures.

Route G is identical to Route A from Midpoint Substation to an area north of the Windermere Hills, where Route G diverges to the southeast. Approximately a dozen resources have been recorded along this segment of Route G, which is very similar to the number recorded along the counterpart segment in Route A. The most sensitive resource along both segments is the California Trail, but Route G also includes two antelope trap sites, which are also rated as highly sensitive.

From the Windermere Hills to Dolly Varden Route G is identical to Route A. From Dolly Varden south to the North Steptoe substation site, Route G diverges to the west. This segment of Route G includes more than 35 recorded cultural resources, about a dozen more than along the counterpart segment of Route A. None of these are rated as highly sensitive.

From the North Steptoe substation site south to the Dry Lake substation site, Route G is identical to Route B.

Alternative Routes - Ely to Delta

The Ely to Delta alternative routes include fewer culturally sensitive areas than the longer north-south routes. The Direct Route crosses the Pony Express and Lincoln Highway alignments. The Cutoff Route also crosses these historic trails and roads and the corridor also includes the Deseret Petroglyph Panel, a National Register listed property. The 230kV Corridor crosses a segment of the Nevada Northern Railroad used by a historic train, the historic Osceola Ditch, and a historic town site. The Southern Route includes the City of Rocks archaeological district. The sensitivity modeling indicates that all the routes, except the Direct Route cross one predicted high sensitivity zone.

Direct Route

Approximately 34 cultural resources have been identified in the two-mile-wide corridor of the Direct Route. About 63 percent of these are prehistoric sites, 24 percent are ethnohistoric resources (Steptoe Valley, Schell Creek Range, Spring Valley, Antelope Valley, Snake Valley, the Drum Mountains, the Little Drum Mountains, and the Sevier Desert), and 13 percent are historic sites.

The most sensitive resources along this route are two alignments of the Pony Express Trail (one of which coincides with the Lincoln Highway).

Cutoff Route

A total of 40 cultural resources have been identified in the two-mile-wide corridor of the Cutoff Route. Of these 66 percent are prehistoric sites, 21 percent are ethnohistoric locales, and 13 percent are historic sites. One sensitivity zone has been projected by the modeling procedures.

The Cutoff Route is identical to the Delta Direct Route from the North Steptoe substation site to the vicinity of the Little Hills. From here, the Cutoff Route diverges to the south to meet and parallel two existing transmission line, one of which it parallels to the Delta area.

Approximately a dozen resources have been recorded along the divergent segment of the Cutoff Route, which is about identical to that recorded along the counterpart portion of the Direct Route. In addition to crossing the Pony Express alignments before diverging, the Cutoff Route corridor also includes the Deseret Petroglyph panel site, another resource ranked as highly sensitive.

230kV Corridor Route

A total of 101 cultural resources have been identified in the two-mile-wide corridor of the 230kV Corridor route. About 79 percent of these are prehistoric sites, 8 percent are

ethnohistoric resources, and 13 percent are historic sites. One high sensitivity zone is projected by the predictive model.

This route would begin in the Robinson Summit substation site and parallels two existing transmission lines, converging with the Cutoff Route in the vicinity of the Buckskin Hills. This route includes 78 recorded resources in addition to the almost two dozen along the coincident portions of the Cutoff and Direct Routes. The most sensitive resources along the 230kV Corridor Route include the historic Osceola Ditch that was constructed for placer mining by Chinese laborers, a historic mining town site, and a segment of the Nevada Northern Railroad used by a historic train.

Southern Route

Approximately 85 cultural resources have been recorded along the Southern Route; about 78 percent of these are prehistoric, 12 percent are ethnohistoric habitation or use areas (Egan Range, Lake Valley, Spring Valley, the Sevier Desert, the Wah Wah Mountains, and the Swasey Wash/Whirlwind Mountains area) and 10 percent are historic. One high sensitivity zone is projected by the predictive model. The most sensitive recorded resource along this route is the City of Rocks archaeological district located at the very western end of the route.

Ancillary Facility Siting Areas

Series Compensation Siting Study Areas

Three series compensation siting study areas are located along the Midpoint to Dry Lake alternative routes. All are in northeastern Nevada. They include the Thousand Springs, U.S. Highway 93, and Goshute Valley siting areas.

A total of approximately 150 cultural resources have been recorded within the Thousand Springs series compensation siting study area. The majority include prehistoric isolates and lithic scatters that were assigned low or moderate sensitivities. A segment of the Central Pacific Railroad, a resource of moderate-high sensitivity, is within the extreme southern edge of the siting area. One high sensitivity resource, a large lithic scatter with antelope traps, is located in the northeastern portion of the siting area.

The U.S. Highway 93 series compensation siting study area is just to the west of the Thousand Springs study area and is comparable in size. Approximately 80 cultural resources have been identified in the U.S. Highway 93 study area. As in Thousand Springs, many are low and moderate sensitivity sites, such as prehistoric isolates and lithic scatters, although 7 resources of moderate-high sensitivity have been recorded. The northern portion of the study area contains most of these sites, including the Melandco railroad siding and an associated historic trash scatter, two prehistoric campsites and an associated lithic scatter, and a segment of the Union Pacific Railroad. A segment of the Central Pacific Railroad again cuts through the southern edge of the siting area. A segment of the California Trail, a high

sensitivity resource, extends through the central portion of the siting area, almost spanning its full length. Although the northeastern corner of the Humboldt Wells National Register eligible district enters the southern portion of the siting area, the majority of the proposed district is not within the boundaries of the siting area. Areas of projected high sensitivity for prehistoric sites have been identified in the Thousand Springs Valley, part of which lies within the siting area.

The Goshute Valley series compensation siting study area is significantly smaller than the Thousand Springs and U.S. Highway 93 and contains only 3 cultural resources. One prehistoric isolate was identified, along with a segment of the Nevada Northern Railroad, historic in age but used commercially, running along the eastern edge of the siting area. A small portion of the Cobre antelope trap site extends into the northeastern edge of the siting area.

Substation Siting Study Areas

Four substation siting study areas are located along the Midpoint to Dry Lake alternative routes. The North Steptoe, Robinson Summit, and Hercules Gap siting areas are in east-central Nevada. The Dry Lake siting area is situated in southern Nevada at the southern terminus of the Midpoint to Dry Lake alternative routes.

The North Steptoe substation siting study area contains four prehistoric isolates, all of low sensitivity. The Steptoe Valley, a Western Shoshone habitation area of moderate sensitivity, extends into the siting area.

A total of 11 cultural resources were identified within the Robinson Summit substation siting study area. The majority are prehistoric lithic and artifact scatters of moderate sensitivity, although one campsite of moderate-high sensitivity was noted. A portion of the Egan Range, identified as a Western Shoshone Resource Procurement area of moderate sensitivity, is within the siting area.

The Hercules Gap substation siting study area is just east of the Robinson Summit study area and is slightly larger. A total of 23 cultural resources have been recorded in the Hercules Gap study area. As in Robinson Summit, most are prehistoric lithic and artifact scatters, again with one campsite noted in the siting area. The Steptoe Valley, recognized as a Western Shoshone habitation area of moderate sensitivity, extends into the siting area. A segment of the Nevada Northern Railroad crosses the eastern edge of the study area. This segment is part of a tourist railroad and was therefore given a high sensitivity ranking.

The Dry Lake substation siting study area contains 21 cultural resources. Ten are prehistoric or historic artifact scatters, primarily of moderate sensitivity. The Dry Lake Range, identified as a Southern Paiute habitation and resource exploitation area also of moderate sensitivity, is present in the eastern portion of the siting area. A cluster of moderate-high sensitivity prehistoric and historic sites, one a campsite, is centrally located within the siting area. The area also contains the Dry Lake railroad siding and townsite, which has been given a high sensitivity ranking. A segment of the Old Spanish Trail/Mormon Road extends through the

center of the siting area, ending at the Dry Lake townsite. The historic trail is a resource of very high sensitivity.

Three substation siting study areas are located in the Utah portion of the study area, near the eastern terminus of the Ely to Delta alternative routes. All are comparable in size, and include the Intermountain, Smelter Hills, and Sevier siting areas.

The Intermountain substation siting study area contains only one cultural resource, a prehistoric ceramic scatter of moderate sensitivity. Similarly, the Smelter Hills siting area just to the west contains a prehistoric lithic scatter, also of moderate sensitivity.

The Sevier siting area, located south of the other two areas, contains 6 cultural resources. Five are of moderate sensitivity and include one rock art site, two prehistoric lithic scatters, and two Goshute and Pahvant Ute habitation and resource exploitation areas (Cricket Mountains and Sevier River Valley). A Paleo-Indian campsite listed on the National Register also falls within the siting area.

Microwave Communication Sites

A series of locations has been identified along the Midpoint to Dry Lake alternative routes as potential microwave communication sites. Three are in Idaho and 14 are in Nevada. No cultural resources were specifically identified at any of these proposed locations. In a few instances, microwave sites may be placed within series compensation or substation siting study areas. The potential considerations regarding cultural resources for these areas are discussed above.

CHAPTER 3

TABLES

TABLE 3-1

Summary of Land Jurisdiction

Midpoint to Dry Lake Routes

Alternative	Miles Crossed BLM	BOR	Forest	State	Private
Route A*	412.5	0.5	0	5.2	95.3
Route B	413.6	0.5	0	5.2	97.3
Route C	397.1	0.5	0	5.2	104.6
Route D	409.6	0.5	0	5.2	98.7
Route E	430.0	0.5	0	5.2	88.5
Route F	406.1	0	0	2.3	115.6
Route G	414.2	0.5	0	5.2	85.3
Utility	409.4	0.5	0	5.2	87.0
Agency	409.4	0.5	0	5.2	88.0

Ely to Delta Routes

Alternative	BLM	Forest	State	Private
Direct	122.9	0	7.2	0
Cutoff*	143.4	0	10.5	0
230kV Corridor*	131.0	9.0	9.0	11.8
Southern	197.4	0	12.0	1.6

* Environmentally Preferred Route

** Utility Preferred and Agency Preferred

TABLE 3-2

Summary of Counties Crossed

(miles)

Midpoint to Dry Lake Routes

COUNTY	*Route A*	*Route B*	*Route C*	*Route D*	*Route E*	*Route F*	*Route G*	*Utility*	*Agency*
Idaho									
Jerome	31.0	31.0	31.0	31.0	31.0	9.8	31.0	31.0	31.0
Twin Falls	41.9	41.9	41.9	41.9	41.9	67.3	41.9	41.9	41.9
Cassia	2.1	2.1	2.1	2.1	2.1	0	2.1	2.1	2.1
Gooding	0	0	0	0	0	15.0	0	0	0
Nevada									
Elko	144.6	146.5	138.5	146.2	152.6	138.5	138.9	138.9	138.9
White Pine	111.3	112.5	111.3	110.2	114.0	111.3	108.7	105.6	107.1
Lincoln	109.3	109.3	109.3	109.3	109.3	109.3	109.3	109.3	109.3
Nye	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0
Clark	26.8	26.8	26.8	26.8	26.8	26.8	26.7	26.7	26.7

Ely to Delta Routes

COUNTY	*Direct*	*Cutoff*	*230kV Corridor*	*Southern*
Utah				
Millard	41.4	98.6	99.5	116.4
Juab	39.8	0	0	0
Nevada				
White Pine	48.9	55.3	61.3	94.6

TABLE 3-3

Alternative Routes Adjacent To WSAs

This tables lists the mileage of the centerlines of alternative routes that pass adjacent to Wilderness Study Areas (WSAs) and Wilderness boundaries.

Midpoint to Dry Lake Routes

	*Route A**	*Route B*	*Route C*	*Route D*	*Route E*	*Route F*	*Route G*	*Utility*	*Agency*
No. of WSAs	5	6	5	7	6	6	7	7	7
0-1/4 mile	18.8	18.8	18.6	19.3	18.8	20.8	18.8	20.8	18.8
1/4-1 mile	14.0	31.8	14.0	28.0	31.8	21.5	14.0	21.5	14.0
1-3 miles	37.5	44.8	37.5	46.3	44.8	39.8	41.0	44.5	44.5

Ely to Delta Routes

	Direct	*Cutoff**	*230 kV Corridor***	*Southern*
No. of WSAs	2	4	2	4
0-1/4 mile	0	6.8	6.0	4.8
1/4-1 mile	0	7.0	6.3	9.3
1-3 miles	7.3	18.3	3.5	13.8
Wilderness	0	1	0	0
0-1/4 mile	0	0	0	0
1/4-1 mile	0	0	0	0
1-3 miles	0	3.3	0	0

WSAs within 3 miles of alternative routes:

Mt. Grafton, South Pequop, Bluebell, Goshute Peak, Goshute Canyon, Goshute Canyon and N.A., Meadow Valley Mountain, Fish & Wildlife 1,2 & 3, Arrow Canyon, Notch Peak, King Top, Lower Salmon Falls Creek, Marble Canyon, Wah Wah Mountains, Howell Peak, Fish Springs, Delamar Mountain, Evergreen, Fortification Range.

Wilderness Areas within 3 miles of alternative routes affected by route:

Mount Moriah

* Environmentally Preferred Route

** Utility and Agency Preferred Route

TABLE 3-4

Scenic Quality/Variety Class Definitions

BLM Scenic Quality Classes	FS Variety Classes
Class A:	**Class A:**
Outstanding areas where characteristic features of landform, rock, water, and vegetation are distinctive or unique in the context of the surrounding region. These features exhibit considerable variety in form, line, color, and texture.	Areas where features of landform, vegetation patterns, water forms, and rock formations are of distinctive or unusual visual quality. These features exhibit considerable variety in form, line, color, and texture.
Class B:	**Class B:**
Above average areas in which features provide variety in form, line, color, and texture and, although the combinations are not rare in the surrounding region, they provide sufficient visual diversity to be considered moderately distinctive.	Areas where features contain variety in form, line, color, and texture or combinations thereof, but which tend to be common throughout the character types and are not outstanding in visual quality.
Class C:	**Class C:**
Common areas where characteristic features have little variation in form, line, color, or texture in relation to the surrounding region.	Areas with very little or minimal variety, if any, in form, line, color, and texture.

TABLE 3-2

Scenic Quality / Variety Class Definitions

BLM Scenic Quality Classes	FS Variety Classes
Class A:	**Class A:**
Outstanding areas where characteristic features of landform, rock, water, and vegetation are distinctive or unique in the context of the surrounding region. [illegible] features contain considerable variety in form, line, color, and texture.	Areas where features of landform, vegetative patterns, water forms, and rock formations are of unusual or outstanding scenic quality. These features [illegible] considerable variety [illegible] [illegible]
Class B:	**Class B:**
Above average areas in which the features provide variety in form, line, color, and texture and, although not rare or unique [illegible] the context of the surrounding region, they [illegible] [illegible]	Areas where features [illegible] [illegible]
Class C:	**Class C:**
Common areas where characteristic features have little variation in form, line, color, or texture in relation to the surrounding region.	Areas [illegible] [illegible]

TABLE 3-5

BLM Visual Resource Management Classes and FS Visual Quality Objectives

VRM	VQO
Class I: This class provides primarily for natural ecological changes; however, it does not preclude very limited activity. Any contrast created within the characteristic environment must not attract attention.	**Preservation:** Management activities, except for very low visual impact recreation facilities, are prohibited. This VQO allows for only "ecological" changes. This management objective applies to wilderness areas, primitive areas, other special classified areas, and some unique management units that do not justify other special classification.
Class II: Changes in any of the basic elements (form, line, color, texture) caused by a management activity should not be evident in the characteristic landscape. A contrast may be seen but should not attract attention. It is important to note that Wilderness Study Areas (WSAs), considered to be Class II by the BLM, had not been identified when the original BLM visual analysis was completed.	**Retention:** Management activities must not be visually evident to the casual forest visitor. Modifications must repeat form, line, color and texture found in the surrounding natural landscape.
Class III: Contrasts to the basic elements (form, line, color, texture) caused by a management activity may be evident and begin to attract attention in the characteristic landscape. However, the changes should remain subordinate to the existing characteristic landscape.	**Partial Retention:** Modifications may be visually evident, but must be integrated into and visually subordinate to the surrounding landscape. Activities may introduce form, line, color and texture not common in the surrounding landscape, but they should not attract attention.
Class IV: Contrasts may attract attention and be a dominant feature of the landscape in terms of scale; however, the change should repeat the basic elements (form, line, color, texture) inherent in the characteristic landscape.	**Modification:** Management activities may visually dominate the surrounding natural landscape; however, they must repeat the naturally established elements of form, line, color and texture to appear compatible with the natural surroundings.
Class V: No longer used (VRM 1986).	**Maximum Modification:** Modifications may visually dominate the surrounding natural landscape, yet when viewed from background distance, activities must appear as natural occurrences within the landscape. Alterations in foreground and middleground views may be out of scale or introduce visual elements not found in the natural landscape.

TABLE 2-5

BLM Visual Resource Management Classes and FS Visual Quality Objectives

VRM	FS
Class I [illegible]	Preservation [illegible]
Class II [illegible]	Retention [illegible]
Class III [illegible]	Partial Retention [illegible]
Class IV [illegible]	Modification [illegible]
Class V [illegible]	Maximum Modification [illegible]

TABLE 3-6

Demographic and Economic Indicators By County

State/ County	Area (sq miles)	Population (1990)	Labor Force (1988)	Unemployment Rate (1988)	Per Capita Personal Income (1987)
IDAHO					
Cassia	2,560	19,532	7,834	7.9	$10,945
Gooding	728	11,633	6,377	5.4	$11,584
Jerome	601	15,138	5,396	8.4	$10,614
Twin Falls	1,944	53,580	26,047	5.8	$11,703
NEVADA					
Elko	17,135	33,530	15,430	5.2	$14,434
White Pine	8,903	9,264	4,370	5.4	$14,047
Lincoln	10,635	3,775	2,150	5.3	$13,973
Nye	18,064	17,781	7,630	4.6	$12,780
Clark	7,927	741,459	342,000	5.4	$15,893
UTAH					
Juab	3,396	5,817	2,003	9.6	$8,200
Millard	6,648	11,333	5,283	5.5	$9,622

Sources: Idaho Department of Employment, 1989/1990.
Idaho Department of Water Resources and University Research Center, June 1985.
Nevada Department of Taxation, 1989.
Nevada Employment Security Department, 1990.
Nevada Department of Administration, 1990
Nevada State Demographer, 1989.
North East Nevada Development Authority 1988/1989.
U.S. Department of Commerce, Bureau of Census, 1980.
Utah Department of Employment Security, 1989.
Utah Office of Planning and Budget, 1988.

TABLE 3-7

Assessed Values and Tax Rates by County

State/County	1990 Average Tax Rate Per $100 Assessed Value	1990 Total County Assessed Value
IDAHO		
Cassia	1.65*	$ 487,609,543
Gooding	2.35*	261,155,102
Jerome	2.45*	351,347,121
Twin Falls	2.27*	1,156,527,810
NEVADA		
Elko	2.50**	574,613,762
White Pine	2.49	120,485,528
Lincoln	2.35***	51,224,433
Nye	2.71	551,845,998
Clark	2.68	11,294,874,939
UTAH		
Juab	1.43*	242,852,400
Millard	1.24*	2,874,632,000

* Represents tax rates for urban areas. Rural tax rates are significantly lower, between 1.25 and 1.50 per $100 assessed value.

** Represents average of rates for three tax districts in county.

*** Represents average of rates for seven tax districts in county.

Sources: Idaho State Tax Commission, 1991.

Lincoln County Assessor's Office, 1989.

Nevada Department of Taxation, 1991.

CHAPTER 3

TABLE 3-8

Population of Study Area Communities

State/Communities	Population 1980	1988**
IDAHO		
Buhl	3,629	3,640
Bliss	208	220
Eden	355	410
Gooding	2,949	2,830
Hansen	1,078	1,090
Hagerman	602	660
Jerome	6,891	6,960
Kimberly	2,307	2,710
Twin Falls	26,209	27,540
Wendell	1,974	2,130
NEVADA		
Elko	14,736	13,600
Ely	4,756	5,170
Wells	1,256	1,290
Caliente	1,111	1,160
Las Vegas	230,030	258,295***
UTAH		
Delta	2,998	7,411*
Hinckley	658	933*

* 1982 estimates from Millard County Growth Management Plan based on assessment of impacts from Intermountain Power Projects. Figures are not official state estimates.

** Figures presented are for 1988 since 1990 census data were not available for all communities.

*** Figure represents City of Las Vegas population from 1990 census and does not represent Clark County

Sources:
Idaho Department of Commerce, 1989
Nevada Department of Taxation, 1989
Utah Department of Employment Security, 1991
U.S. Department of Commerce, Bureau of Census, 1980, 1990
U.S. Department of Agriculture, 1982

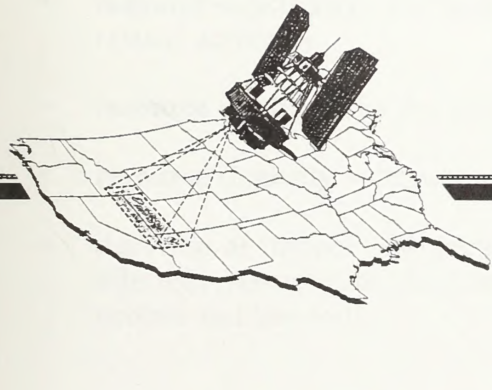
TABLE 3-9

States with Transmission Line Field Limits

STATE AGENCY	WITHIN RIGHT-OF-WAY	AT EDGE OF RIGHT-OF-WAY	COMMENTS
A. 60-Hz Electric Field Limit, kV/m			
Florida Department of Environmental Regulation	8(≤230 kV) 10(500 kV)	2	Codified regulation, adopted after a public rulemaking hearing in 1989.
Minnesota Environmental Quality Board	8		12 kV/m limit on the HVDC nominal electric field.
Montana Board of Natural Resources and Conservation	7[b]	1[a]	Codified regulation, adopted after a public rulemaking hearing in 1984.
New Jersey Department of Environmental Protection		3	Used only as a guideline for evaluating complaints.
New York State Public Service Commission	11.8 (7,11)[b]	1.6	Explicitly implemented in terms of a specified right-of-way width.
North Dakota Public Service Commission	9		33 kV/m limit on the HVDC total electric field.
Oregon Facility Siting Council	9		Codified regulation, adopted after a public rulemaking hearing in 1980.
B. 60-Hz Magnetic Field Limit, mG			
Florida Department of Environmental Regulation		150 (≤230 kV) 200 (500 kV)	Codified regulations, adopted after a public rulemaking hearing in 1989.
New York State Public Service Commission		200	Adopted August 29, 1990.

[a]Landowner may waive limit
[b]At road crossings

Source: TDHS Report, 1989; TDHS Report, 1990



CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

The potential environmental consequences (impacts) described in this chapter are based on the environmental effects that would result from the construction and operation of the transmission line along the alternative routes. The proposed action describes the proposed project design features, construction techniques, operational characteristics, and maintenance and abandonment procedures. The access requirements involved where and to what extent roads would have to be built or upgraded to construct and maintain the proposed project facilities for each routing alternative. Dames & Moore provided information on where existing roads were sufficient or would require upgrading, and where new access roads would have to be constructed. Potential vegetation clearing was also estimated.

The assumed centerline for the proposed action and alternative routes is approximately 2500-feet-wide. The proposed 200 feet right-of-way would be determined during engineering designs and would lie within this approximately 1/2 mile wide zone.

Impacts that would result from constructing and operating the proposed action and alternatives were determined by comparing these actions to the existing environment (described in Chapter 3). First the various types of impacts that could occur were defined and impact locations and intensity were identified. Impacts can be either direct or indirect, adverse or beneficial, and short- or long-term. Most of the impacts resulting from the Southwest Intertie Project (SWIP) alternatives would be adverse, direct, and long-term. Some of the socioeconomic impacts would be beneficial. Visual impacts and other impacts (e.g., biological, cultural, etc.) related to increasing the potential access into remote areas are considered indirect and long-term.

The impact locations and intensity were recorded by link number and milepost, and the impacted area described. In order to determine impact intensity, an "impact model" was developed for each resource classification using the same criteria:

- **resource sensitivity** - the probable response of a particular resource to project-related activities
- **resource quality** - the pre-project condition of the resource potentially affected
- **resource quantity** - the amount of the resource potentially affected
- **duration of impact** - the period of time over which the resource would be affected, measured as short-term (up to a few years) or long-term (life of the project and beyond)

- **time of year** - the season or period of time which the resource would be affected

Although the underlying criteria were conceptually the same for each model, characteristics of the criteria varied according to the characteristics of each resource. Applying the models to each route yielded qualitative levels of high, moderate, low or no-identifiable impacts:

> **High Impact** - A high level of impact would result if the construction, operation, maintenance, or abandonment of the proposed project would potentially cause a significant or substantial adverse change or stress to an environmental resource(s).
>
> **Moderate Impact** - A moderate impact would result if the construction, operation, maintenance, or abandonment of the proposed project would potentially cause some adverse change or stress (ranging between significant and insignificant) to an environmental resource(s).
>
> **Low Impact** - A low impact would result if the construction, operation, maintenance, or abandonment of the proposed project would potentially cause an insignificant or small adverse change or stress to an environmental resource(s).
>
> **No-Identifiable Impact** - No identifiable impact would be indicated where no measurable impact would occur to the specific resource(s) under investigation.

After the impact intensity, duration, and locations were identified, mitigation measures were examined to see if they could be effective in reducing either the intensity or duration of impacts. Mitigation for the proposed project included two types of programs: generic and selective. Generic mitigation consists of measures or techniques to which Idaho Power Company (IPCo) committed on a nonspecific, or project-wide, basis as part of its proposed project plan. Generic mitigation measures are listed in Table 4-1. Selectively committed mitigation measures, listed in Table 4-2, of measure(s) or techniques to which IPCo committed to on a case-by-case (or "selective") basis after impacts were identified and assessed. Mitigation measures can be applied individually to impacts or can be combined with other mitigation measures to reduce or even eliminate impacts. The impacts remaining after applying mitigation measures are termed residual impacts.

In some cases where impacts were low, or mitigation would not be effective, no mitigation was recommended. Where mitigation was warranted and would be effective, mitigation recommendations were made by the resource specialists to reduce or eliminate specific impacts.

Because the right-of-way grant for the selected route between Ely and Delta would be conveyed to Los Angeles Department of Water and Power (LADWP), mitigation commitments, generic and selective, for this route are conveyed in the same manner. A summary of the miles of committed mitigation for the environmentally, agency, and utility preferred routes are documented in Table 2-6.

Specific impacts for each resource are documented in the technical reports described in the introduction to Chapter 3. The technical reports are accompanied by data tables that indicate the location and description of specific resource features and values, the initial impact levels

to these resources, the mitigation measure(s) recommended to reduce impacts, and the residual impacts expected following mitigation. The technical reports are available for public review (refer to Appendix H for the locations where technical reports can be reviewed). The environmental data, impact assessment, mitigation planning, and comparative data for substation and microwave facilities are located in Appendices E and F.

NATURAL ENVIRONMENT

Air Quality

Installation/Construction Emissions and Impact - The construction phase of the proposed SWIP includes installation of towers and construction of substations and series compensation facilities. Air quality concerns include fugitive dust and construction equipment exhaust emissions. Exhaust emissions from construction equipment include nitrogen oxides (NO_x), carbon monoxide (CO), sulfur oxides (SO_2), hydrocarbons (HC), total suspended particulates (TSP), and fine pollutants from equipment usage. In addition, open burning of slash materials may be necessary in remote areas. Emissions from construction would be confined to daytime activity for the duration of the construction period. A ten-hour work day was assumed in this analysis.

Pollution emissions that occur during construction are generally exempt from Prevention of Significant Deterioration (PSD) review because the PSD requirements specifically exempt temporary increases in SO_2 and TSP emissions. Permit applications would need to be filed with the Nevada and Idaho Air Quality Boards and the Clark County Health Department for state review.

Operational Phase Emissions and Impacts - Principal air resource impacts associated with the operational phase of the transmission system would include dust and vehicle emissions during periodic maintenance checks or emergency repair activities.

For maintenance activities, potential effects to air quality would be associated with dust when accessing the transmission line. Effects from maintenance activities are expected to be very short in duration and would not significantly effect overall ambient air quality.

Mitigation - Because of potential impacts from construction activities, several measures may be necessary to mitigate particular impacts. Control technologies for dust control (e.g., watering and chemical stabilization) should be used. Watering is the most common, the least expensive, and is environmentally preferred. An effective watering program can reduce dust emissions up to 50 percent (EPA 1980). Using chemicals for long-term dust suppression can be used, but their cost and environmental effects to plants and animals can be detrimental factors. Thus, an effective watering program would be sufficient for dust control. Limiting traffic on dirt roads during construction would also help limit dust. Additional information on air quality effects and potential mitigation can be found in the Technical Report.

Earth Resources

Introduction

The issues of concern for earth resources regarding the construction of the transmission line include loss of soil and soil productivity, destruction of significant fossils, conflicts with mineral development, degradation of water quality, and possible scarring and increased erosion in landslide areas.

Methods

The following factors were considered during the impact analysis:

- type of impact
- sensitivity of the resource
- access level
- amount of impact
- duration of impact
- suggested mitigation measures to reduce impacts
- other proposed projects (cumulative impacts)

Initial impact levels were assigned to each of the potentially affected resources using computer models and the EIS database. Next, mitigation measures were analyzed to determine their effectiveness to reduce the initial impacts. Generic mitigation measures (Table 4-1) and agency Best Management Practices (BMPs) applied to data categories with a low to moderate initial impact are expected to reduce the impacts to low or not identifiable. Residual impacts, those impacts remaining after mitigation, were then determined and documented. Impact levels ranged from no identifiable to low, moderate, or high.

Several generic mitigation measures (Table 4-1) would be applied to reduce potential impacts to the earth and water resources. These measures include restricting construction vehicle movement outside of the right-of-way (#1), areal limits to construction activities would be predetermined (#2), recontouring and revegetating construction areas where needed (#s 3 and 4), roads would be built at right angles to streams and culverts installed where necessary (#13), and hazardous materials would be properly handled and disposed of (#20). Selective mitigation measures (Table 4-2) committed to include avoiding sensitive features (#6) and helicopter construction (#12).

Sensitive Resource	Mitigation Measure	Residual Impact
Areas of High Paleontological Sensitivity (miles along centerline)	Paleontological resources would be mitigated on a site basis as determined by BLM-approved paleontologist or by appropriate agency resource specialist	None
Soils with High Hazard of Water Erosion (miles along centerline)	Refer to Table 4-1 Number 12 from Table 4-2	Moderate
Soils with High Hazard of Wind Erosion (miles along centerline)	Refer to Table 4-1	Low
Known Potential Landslide Hazard (miles along centerline)	Number 6 from Table 4-2	None
Areas of Active Mining (miles along centerline)	Number 6 from Table 4-2	None
Perennial Streams (number crossed along centerline)	Refer to Table 4-1 Number 6 from Table 4-2	Not Identifiable
Perennial Lakes (number crossed along centerline)	Refer to Table 4-1 Number 6 from Table 4-2	Not Identifiable
Springs (number within 0.5 miles of centerline)	Refer to Table 4-1 Number 6 from Table 4-2	Not Identifiable

Results

Residual impacts and cumulative effects were developed and evaluated with federal agency land management plans. The technical report contains detailed results of the studies (refer to Appendix H for the locations where technical reports can be reviewed).

Adherence to the generic and selectively committed mitigation measures (Tables 4-1 and 4-2) results in no identifiable to low residual impacts along the proposed routes since known potential landslide areas would be avoided. If significant fossils are found during construction they would be mitigated on a site by site basis under the direction of a BLM certified paleontologist or other appropriate agency paleontological resource specialist. Active mining operations and land anticipated to be developed for mining in the near future would be avoided. Perennial streams, lakes, and springs would be spanned or avoided.

Construction roads and tower sites would be located such that an adequate buffer is provided to prevent increases in sedimentation. Soil loss from wind erosion would be minimized through the application of water during construction where required. Although soil compaction along access roads is expected to occur, it would be mitigated by mechanical means where required.

The removal of fine soil materials beneath the desert pavement is likely to occur if the surface is broken by construction vehicles. The ruts that form may persist long term. However, the small areal extent of this impact would result in a low overall impact to the soils resource. Desert pavement occurs along the routes primarily south of U.S. Highway 93 in the Dry Lake Valley northeast of Las Vegas, Nevada.

Soil loss and loss of productivity would be minimized in most areas. However, soil loss and loss of productivity is likely to occur primarily on steep slopes (slope steepness greater than 35 percent) where soils have a potential hazard of water erosion and where new construction access is required. For these areas a moderate residual impact is expected, since reestablishing vegetation and the effects of other mitigative measure to reduce erosion would require a longer time to become effective.

Alternative Routes - Midpoint to Dry Lake

In comparing the proposed routes, Alternative Routes A, D, and G have the least high adverse impacts of water and wind erosion potential areas, and high paleontological sensitivity areas crossed. However, alternative Routes B, C, E, and F have only slight increases in total impacts.

The following summarizes the location and approximate mileage distance along the centerline resulting in moderate residual impacts that may occur from the construction of roads and towers on soils located on steep slopes with a high water erosion potential.

Route A

There would be a total of 2.7 miles of moderate residual impacts along this route. Steep slopes in isolated areas and high wind and/or water erosion potential would be the main cause of the impacts that would result near Henry, Nevada, along Link 130, near Willow Creek, Nevada, along Link 160, near Currie Hills along Link 250, and near Lages Station along Link 260.

Route B

There would be a total of 3.6 miles of moderate residual impact along Route B as a result of steep slopes and high wind and/or water erosion potential. Impacts would be expected near

Trout Creek along Link 92, near Clifside in the Toano Range along Link 222, in the area of Boone Spring in the Antelope Range along Link 226, and around the Lages Station area along Link 260.

Route C

A total of 1.9 miles of moderate residual impacts would be expected along Route C. Similar to Route A and B, the impacts would result from high wind and/or water erosion potential and on steep slopes. Impacts would occur near Trout Creek along Link 92, around Currie Hills along Link 250, and in the area of Lages Station along Link 260.

Route D

There would be a total of 2.9 miles of moderate residual impacts along Route D resulting from high water and/or wind erosion potential and steep slopes. Impacts would occur in the area of Henry, Nevada along Link 130, near Willow Creek along Link 160, and near Wood Hills along Link 180.

Route E

There would be a total of 3.8 miles of moderate residual impacts along Route E resulting from highwater and/or wind erosion potential and steep slopes. Impacts would occur near Henry, Nevada, along Link 130, near Willow Creek along Link 160, near Clifside along Link 222, and in the area of Boone Spring along Link 226.

Route F

There would be a total of 1.9 miles of moderate residual impact along Route F. The impacts are the result of high wind and/or high water erosion potential of the soils and steep slope conditions. Moderate residual impact would result in steep slope areas near Trout Creek (Link 92), near Currie Hills (Link 250), and near Lages Station.

Route G

A total of 0.4 mile of moderate residual impact would result along this route. The impact is the result of soils with high water erosion potential and steep slope conditions of greater than 35 percent. The impacts would occur near Henry, Nevada (Link 130).

Alternative Routes - Ely to Delta

Direct Route

There would be a total of 5.9 miles of moderate residual impacts along this route resulting from a combination of steep slopes and high water and/or wind erosion potential. The impacts would occur in the Schell Creek Range east of Cherry Creek along Link 263, near Tippett Pass and the Red Hills along Link 266, near Tin Springs Mountain along Link 620, and in the Confusion Range along Link 621.

Cutoff Route

This route would have a total of 6.8 miles of moderate residual impacts in the Schell Creek Range east of Cherry Creek along Link 263, near Tippett Pass and the Red Hills along Link 266, in the Conger Range along Link 268, and near Marjum Pass along Link 462. These impacts would result from steep slopes and a high potential for wind and/or water erosion potential.

230kV Corridor Route

The 230kV Corridor Route would have a total of 4.6 miles of moderate residual impacts in Cooper Canyon along Link 380 and in the Buckskin Hills along Link 462. Steep slopes and areas of high water and/or wind erosion potential would account for these impacts.

Southern Route

The Southern Route has a total of 5.1 miles of moderate residual impacts in Water Canyon along Link 364 and east of the Ferguson desert along Link 462. Areas of high water/or wind erosion potential and steep slopes are where these impacts would occur.

Consistency with Agency Management Plans

The various agencies' resource management plan objectives state that soil productivity would be maintained and sediment resulting from soil erosion would be minimized by applying soil and water conservation practices. These objectives would be obtained by incorporating Best Management Practices (BMPs) into all land use and project plans. These BMPs would serve as the principal mechanism for controlling nonpoint pollution sources and meeting soil and water quality goals. All of the alternative routes comply with the objectives of the resource management plans in regard to earth and water resources.

Biological Resources

Introduction

The vegetation types, sensitive wildlife, and plant species inventoried are described in detail in the technical report (refer to Appendix H for the locations where technical reports can be reviewed). Impact matrices were developed to identify the initial impacts anticipated as a result of the proposed project, to recommend mitigation measures to minimize those impacts, and to determine residual impacts.

Issues for wildlife species and important wildlife habitats are related primarily to increased public access into remote areas and/or ground disturbance. Ground disturbance caused by construction of the transmission line could result in habitat destruction and degradation, and future erosion problems where stabilizing plants are lost. Increased public access into remote areas, during and following construction, may result in increased human harassment of all classes of wildlife, increased levels of poaching, and increased take of certain species by legal hunters, trappers, or fishermen. Increased public access can also result in habitat damage from off-road vehicle use, accidentally set fires, and direct mortality of individual animals resulting from increased or higher speed vehicular traffic.

The GIS impact assessment models and matrices are described in the technical reports. Also in the technical report are narrative descriptions and data tables for each of the alternative route segments studied. The technical reports are available for review at the agency offices listed in Appendix H.

Methods

Impact types considered in the impact analysis models were:

1) Threatened, Endangered, Rare or Unique Species:
   - affect any federally classified threatened or endangered species or critical habitat thereof
   - affect any state listed protected, threatened, unique or otherwise sensitive species or habitat thereof

2) General Wildlife:
   - create a barrier or hazard to the migration or movement of any wildlife species
   - alter the diversity of any biotic community or populations of any animal species communities, or areas

3) Increase human activity/public access.

To determine the intensity (level) of impacts that would result from the construction and operation of the SWIP, two models were developed to identify direct and indirect impacts. The access requirements were determined in a model that was compared with sensitive wildlife resources and habitats.

Where access and other ground disturbance would be greater and sensitive biological resources were found (e.g., wildlife habitats, sensitive plants, etc.), initial impacts would be of a higher intensity. These adverse impacts would be long-term unless revegetation would be done.

Where access roads would have to be constructed into currently remote areas, indirect long-term impacts would likely result. These impacts would be from increased pressure on biological resources from potentially greater presence of humans (e.g., legal hunting, poaching, fishing, off-road vehicle access, etc.). Also refer to cumulative effects for a discussion of some of these indirect impacts that would occur over time.

Adverse, indirect, and long-term impacts would also result simply from the presence of the transmission lines. For example, because golden eagles will use transmission towers for hunting perches, predation on sage grouse within their sensitive habitats (e.g., leks and wintering grounds) may increase. Also, a similar predation issue is found for juvenile desert tortoise where ravens have transmission towers as hunting perches. These impacts were documented where these impact types could be identified, and where sensitive habitats corresponded to the potential presence of one of the alternative routes.

Mitigation Planning

In order to reduce potential impacts resulting from ground disturbance and increased levels of public access along the various alternative routes of the proposed transmission line, generic and selectively recommended mitigation measures were applied to initial impact levels.

Generic mitigation is part of the project description, is applied uniformly along the route, and tends to reduce impact potential to many resources (refer to Table 4-1). For example, restricting vehicle construction equipment movement to predesignated routes (#1) and recontouring and revegetating disturbed areas where necessary (#3 and #4), and construction of roads at right angles to streams (#13).

Selectively recommended mitigation measures are more specific and are applied to mitigate specific initial impacts (refer to Tables 4-2). These measures include overland access to minimize ground disturbance (#2), placement of towers to avoid sensitive features (#6), modified tower design to minimize avian conflicts (#7), use of helicopter construction under certain conditions (#12), and limiting construction activities during sensitive periods (#11).

Results

Alternative Routes - Midpoint to Dry Lake

Route A

Wildlife - From the Midpoint Substation to Jackpot, Nevada (Links 10, 20, 40, 41, 50, 70), initial impact levels (before applying of mitigation) resulting from construction of the project would be generally low and moderate. Mitigation (discussed at the beginning of this section) would reduce these impacts to low. The only high residual impacts on this route in Idaho would be where sage grouse leks are located near the Nevada state line (Link 70).

Federal and state biologists are concerned that the SWIP would add yet another cumulative impact on sage grouse populations in southern Idaho and eastern Nevada (refer to cumulative effects section at the end of Chapter 4). Concern has focused on the increase in public access within sage grouse habitats, placement of towers and access roads in strutting or crucial wintering grounds, and the fact that predators of sage grouse (e.g. golden eagles) use the transmission towers as hunting perches. Adult and immature birds and nests are all thought to be vulnerable. Because there is no way to mitigate predation of sage grouse in these areas, these impacts would remain high even after mitigation and would be long term and significant. Also, eliminating access would be difficult, and there would be some potential for disturbance and poaching in addition to the loss of habitat and disturbance due to construction activities.

There would be high initial impacts to long-billed curlew nesting habitat where the project would significantly increase potential public access (Links 10, 20, 40, 70) due to the difficulty of eliminating access in areas of flat or gentle terrain and the vulnerability of nesting curlews. These impacts would be adverse and long-term. However, mitigation measures (discussed at the beginning of this section) would reduce most of these impacts to insignificant levels.

From Jackpot to northwest of the Windermere Hills (Links 72, 101, 102, 110, 130, 160, 161, 162) in northern Nevada, Route A would cause mainly moderate to high initial impacts. These initial impact would be due primarily to crucial mule deer and pronghorn habitats, bald eagle wintering and potential nesting habitat (Link 72), and sage grouse leks and wintering habitat (Links 160, 161, 162). The impacts to sage grouse are largely unmitigable because of potential predation by golden eagles on adult and immature birds (see discussion above). There would be 0.2 mile of high residual impacts to sage grouse (Link 160). These impacts would be significant, adverse, and long-term. However, applying mitigation measures along this portion of Route A would reduce all other high impacts to insignificant levels.

Moderate residual impacts would occur in some areas along this segment of Route A where public access would be significantly increased in big game habitats and in ferruginous hawk habitats. These impacts would be adverse and long-term, but are not considered significant.

Because it is difficult to completely restrict new access where roads and trails have been constructed, there can be increased pressure on these species by hunting/poaching and harassment.

From the Windermere Hills to north of Interstate 80 near Oasis, Nevada (Links 1612, 152, 200), Route A would traverse the northern toe of the Windermere Hills and then southeast to East Squaw Creek. High initial impacts along this portion of the route would be primarily caused by increased public access in pronghorn winter range for 0.5 miles (Link 1612). These high impacts would be reduced to moderate, insignificant levels following mitigation (discussed at the beginning of this section). An additional 1.8 miles of high initial impacts would result to sage grouse winter range and leks north of East Squaw Creek (Link 200). Similar to the impacts to sage grouse described above, these impacts would remain high following mitigation.

In the section of the Route A between north of Interstate 80 and Dolly Varden in the Goshute Valley (Links 211, 212), high initial impacts would be expected to result from increased public access. Potentially high initial impacts from ground disturbance to sage grouse leks would occur on Link 211 at the north end of Goshute Valley (between mileposts 14.7 and 16.3). Following mitigation, these impacts to sage grouse leks would be expected to remain adverse and significant for about 1.6 miles.

From the Dolly Varden in the southern end of Goshute Valley to the North Steptoe substation site (Links 211, 230, 250, 259, 260), high initial impacts from ground disturbance would occur for 0.2 miles because of sage grouse leks and known occurrences of wintering bald eagles near the north end of Steptoe Valley (Link 259). Despite applying mitigation measures, 0.2 miles of high residual impacts (adverse and significant) would remain.

From the North Steptoe substation site to the Robinson Summit substation site (Links 270, 291, 293, 310), increased public access would cause high initial impacts to sage grouse leks, long-billed curlew, and sandhill crane from increased public access near Monte Neva Hot Springs at the base of the Egan Range (milepost 11.8 to 11.9). No high residual impacts would be expected following mitigation. Ground disturbance along this segment of the route would result in high initial impacts along the base of the Egan Range (Link 291) in the Steptoe Valley (mileposts 4.4 to 6.1 and 7.9 to 11.8) and (Link 293) in the Egan Range (mileposts 1.9 to 4.4 and 4.8 to 6.5). Following mitigation (discussed at the beginning of this section), high residual impacts would occur for 3.0 miles in the Steptoe Valley (Link 291) and for 4.5 miles in Dry Canyon (Link 293). High residual impacts (significant impacts) on both links would result from the presence of sage grouse leks (refer to previous discussion of sage grouse effects).

Route A from the Robinson Summit substation site to the Dry Lake substation site (Links 340, 362, 363, 669, 670, 672, 673, 675, 690, 700), would cross through Great Basin desertscrub habitats along the north portion of this segment and Mojave desertscrub habitats in the southern portion. Generally, initial impacts for most of the route would be moderate to high. High initial impacts would be most notable where habitat of the desert tortoise are encountered in Coyote Spring Valley (Links 690, 700). Adding a transmission facility would reduce the amount of suitable tortoise habitat because of roads needed to construct and maintain the line, and would increase the potential for human activity.

The Links 690, 700 and 720 of the proposed transmission line traverse 52.1 miles of desert tortoise habitat. Link 690 enters desert tortoise habitat in the extreme southern portion of the Pahranagat Wash. The first three and one half miles of habitat are in an area designated as Category III. This area is at the northern limit of species' distribution and tortoise densities are very low (0 to 10 tortoises per square mile). The last 15.3 miles of Link 690 are in Category I habitat. Tortoise densities in this area (northern most extension of Coyote Spring Valley) range from low to very high (140+ per square mile.)

As Link 700 runs south along U.S. Highway 93 through Coyote Spring Valley, it traverses 30.3 miles of Category I habitat. About 14 miles is located on private land owned by Aerojet and is, therefore, not officially categorized by the BLM. However, for the purposes of this Assessment, it will be considered to be Category I habitat as requested by the BLM (Slone, 1990). This area has been proposed as a Tortoise Management Area in the Short-term Habitat Conservation Plan for Clark County (Regional Environmental Consultants, 1990). Surveys in this area indicate relatively high densities of tortoises (45 to 140+ tortoises per square mile) in portions of the valley. The habitat is generally considered to be in good condition. As the line enters the Dry Lake Valley (Link 720), it traverses 3.1 miles of Category III habitat. The dry lake bed itself is not tortoise habitat. Tortoise densities in this portion of the Dry Lake Valley are in the very low to low range (0 to 45 tortoises per square mile.)

Impacts to desert tortoise from increased human activity include being crushed by vehicles, shooting, illegal collecting, and destruction of burrows. Adverse, indirect, and long-term impacts could result simply from the presence of the transmission lines because ravens may use the transmission towers for hunting perches, and predation on juvenile desert tortoise may increase. Predation by ravens usually a problem near urban areas, water bodies, and solid waste disposal sites, where ravens are typically found. Although raven predation is not considered a significant problem at this time, federal biologists are concerned that the problem may become more significant if Las Vegas and surrounding areas continue to develop and expand.

Mitigation measures applied during construction would effectively mitigate direct impacts to desert tortoise (e.g., tortoise or tortoise burrows being crushed by vehicles, etc.). However, it is unclear how raven predation, if it becomes a significant problem in the future, can be effectively mitigated.

A Biological Assessment is being prepared for desert tortoise, and that formal consultation with the Fish & Wildlife Service (FWS) under Section 7 of the Endangered Species Act (1974) will be taking place by the fall of 1992. BLM requires that an opinion be rendered by FWS on the desert tortoise prior to a Record of Decision (ROD) on the SWIP. If a favorable opinion is rendered by FWS, detailed mitigation measures would become part of the stipulations required to construct and operate the SWIP. One of the major mitigation measures would be to construct the project through the sensitive area during the winter months when the tortoise are inactive (refer to #11 in Table 4-2). The Stateline Resource Area is preparing a Draft Resource Management Plan (RMP) for public review. The area of Coyote Springs Valley may be proposed as an Area of Critical Environmental Concern (ACEC) for desert tortoise in some alternatives. The BLM's RMP process is being prepared in coordination with the Short-term Habitat Conservation Plan for desert tortoise that was

prepared by Clark County (1991). Refer to the Technical Report for a description of the habitat classification for desert tortoise (e.g. category I, II, and III).

The burrowing owl is a species of concern to the Nevada Department of Wildlife. Burrowing owls occur in Mojave desertscrub habitat and, therefore, could occur on Links 690, 700, and 720. Burrowing owls often use desert tortoise burrows and could be found throughout all tortoise habitat along the project. Limiting construction to winter months to reduce conflicts with owls has been recommended by BLM.

Other highly sensitive features include ferruginous hawk nest sites (Link 673, 340), crucial raptor nesting areas occur (Links 669, 672), sage grouse leks (Link 669), crucial mule deer winter range and migration corridors (Links 672, 669, 670, 363, 673), and desert bighorn sheep movement/migration corridors (Links 690, 700). There are two bighorn sheep water developments in the southern end of the Arrow Canyon Range and up to two more may be constructed before construction of the project. The BLM has recommended no new access within 2 miles of water and winter construction.

High initial impacts from potentially increased public access along this section of the Route A would result from the higher potential for human interaction with mule deer, desert bighorn sheep, and ferruginous hawks. Specifically, there would be potential high initial impacts to mule deer migration corridors and ferruginous hawk habitat along Sierra Valley into Jakes Wash (Link 363 between mileposts 10.6 and 11.1). There would also be potential high impacts to a mule deer migration between milepost 11.3 and 11.7 on Link 363 at the southern end of Sierra Valley. Along the foothills at the western edge of White River Valley (Link 669) the route would cause high initial impacts for 6.5 miles in a mule deer migration corridor. There would be 0.3 miles of high initial impacts to key deer winter range at the southern limit of the Egan Range in the White River Valley (Link 672). These impacts would be mitigated to insignificant levels (mitigation discussed at the beginning of this section).

Where Route A would cross the northeast end of Dry Lake Valley (Link 673), there would be approximately 1.7 miles of high initial impacts to ferruginous hawk nest sites and 0.7 miles of similar impacts to key deer winter range. There would be approximately 2.3 miles of potentially high initial impacts relating to increased public access and desert tortoise habitat and bighorn sheep movement corridors along the southern end of Delamar Valley and into Pahranagat Wash (Link 690). These impacts would be mitigated to insignificant levels (mitigation discussed at the beginning of this section).

Along Route A in Sierra Valley and into Jakes Wash (Link 363) there would be about 1.0 mile of high initial impacts (from ground disturbing activities) to ferruginous hawk habitat and nesting areas of other raptor species. There would be 12.7 miles of high initial impact from ground disturbance to mule deer migration corridors and staging areas and raptor nesting areas along the foothills at the western edge of White River Valley (Link 669). Where this route would cross the northeast end of Dry Lake Valley (Link 673), there would be 1.7 miles of high initial impact to nesting ferruginous hawks.

Mitigation measures (discussed at the beginning of this section) are expected to be effective in reducing high initial impacts on the Robinson Summit to Dry Lake section of the Route A to insignificant levels.

Moderate residual impacts would occur in some areas along this segment of Route A where public access would be significantly increased in big game habitats and in ferruginous hawk habitats. These impacts would be adverse and long-term, but are not considered significant. Because it is difficult to completely restrict new access where roads and trails have been constructed, there can be increased pressure on these species by hunting/poaching and harassment.

Moderate residual impacts to desert tortoise would likely result in some areas where public access is increased significantly.

Vegetation/Sensitive Plant Species - No federally listed endangered or threatened plant species are known to occur, however, this does not mean that none exist, as surveys have not been conducted over much of the area.

Ground disturbance along Route A would result in moderate to high initial impacts where two sensitive plant species, Astragalus tetrapterus and Allium anceps, occur for 1.3 miles along the assumed centerline east of Salmon Falls Creek Reservoir (Link 70). Additional moderate to high initial impacts would be expected where A. calycosus var. monophyllidius occurs in White River Valley (Link 670) and where Arenaria stenomeres occurs in Coyote Spring Valley and Arrow Canyon (Link 700). Potential increases in public access would not be considered a serious threat. Following mitigation, residual impacts are expected to be low. Revegetation of disturbed areas in dry climates is difficult. Rehabilitation and revegetation will be addressed specifically in the Construction, Operation, and Maintenance Plan.

Two C2 species and one C1 species occur within the one mile of the assumed centerline. Castilleja salsuginosa (C1), also listed as critically endangered on the state list, occurs near Monte Neva Hot Springs in Steptoe Valley (Link 291). Increased public access to the Springs could result in trampling and destruction of habitat. Arabis falcifructa, a C2 species, occurs along the western edge of Thousand Springs Valley (Link 162) and Mentzelia mollis occurs in Coyote Spring Valley (Link 700). Penstemon bicolor, P. b. roseus and Astragalus triquestrus are Category 2 candidate species which could occur on Links 690, 700, and 720. These plant species would most likely not be impacted by construction, if overland access to tower sites along the centerline were predesignated.

Route B

Wildlife - From Midpoint Substation to Jackpot, Nevada, the initial and residual impacts expected for Route B would be the same as those described for Route A.

From Jackpot to north of Interstate 80 near Oasis, Nevada (Links 91, 92, 140, 141, 142, 144), there would be high initial impacts for approximately 3.3 miles to sage grouse leks and crucial mule deer summer habitat along Trout Creek (Link 92) and 0.3 mile to sage grouse winter grounds in the Trout Creek area (Link 91) that would result from increased public access and ground disturbance. There would be high initial impacts to a sage grouse lek and approximately 1.5 miles high initial impacts to sage grouse winter range in Toano Draw

(Link 142). Near the headwaters of Trout Creek (Link 92), there would be 2.2 miles of initial high impacts associated with sage grouse leks. Another 4.4 miles of high initial impacts associated with sage grouse leks and sage grouse winter range would occur in Toano Draw (Link 142). Following mitigation (defined at the beginning of this section), there would remain approximately 0.3 miles of high residual impacts to sage grouse winter range in Trout Creek (Link 91), 1.5 miles to sage grouse leks at the headwaters of Trout Creek (Link 92), and 4.4 miles to sage grouse leks and sage grouse winter grounds in Toano Draw (Link 142).

Federal and state biologists are concerned that the SWIP would add yet another cumulative impact on sage grouse populations in southern Idaho and eastern Nevada (refer to cumulative effects section at the end of Chapter 4). Concern has focused on the increase in public access within sage grouse habitats, placement of towers and access roads in strutting or crucial wintering grounds, and the fact that predators of sage grouse (e.g. golden eagles) use the transmission towers as hunting perches. Adult and immature birds and nests are all thought to be vulnerable. Because there is no way to mitigate predation of sage grouse in these areas, these impacts would remain high even after mitigation and would be long term and significant. Also, eliminating access would be difficult, and there would be some potential for disturbance and poaching in addition to the loss of habitat and disturbance due to construction activities.

Ground disturbance would result in approximately 0.3 mile of high initial impacts to key deer winter range, and pronghorn winter range in the Trout Creek area (Link 91). Near the headwaters of Trout Creek (Link 92), there would be 2.2 miles of initial high impacts associated with critical deer summer range. Mitigation measures (discussed at the beginning of this section) would be expected to effectively reduce high impacts to insignificant levels along this segment of Route B, except for long-term impacts of raptor predation on sage grouse.

Generally, impacts along the segment of Route B, from the north of Interstate 80 to the North Steptoe substation site (Links 221, 222, 224, 226, 259, 260), would be low, with some moderate impacts. Moderate initial impacts along this segment of the route would be associated with occurrences of peregrine falcon and sage grouse. High initial impact to sage grouse leks would occur along this segment of Route B in the Goshute Valley (Links 221) and to sage grouse leks and bald eagle habitat in Antelope Valley (Link 226). Mitigation measures (discussed at the beginning of this section) would be expected to effectively reduce high impacts to insignificant levels along this segment of Route B, except for long-term impacts of raptor predation on sage grouse.

From the North Steptoe substation site to the Robinson Summit substation site, initial impacts for Route B would be generally low to moderate where Route B would cross through Antone Pass at the north end of the Egan Range into Butte Valley (Link 280). High initial impacts along this section of the route would occur where increased public access would be significant in important water use areas (milepost 5.7 to 6.1) and in an area that is used by bald eagle, ferruginous hawk, and sage grouse (milepost 11.8 to 11.9). Potential impacts from ground disturbance along this section of Route B would range from low to high, with a fairly extensive potential for high initial impacts in areas where sage grouse leks and long-billed curlew and sandhill crane occur. Key water use areas are also identified as locations where high impacts could occur, as are areas of sage grouse wintering grounds. High initial

impacts would occur for approximately 14.2 miles where this route crosses through at the north end of the Egan Range into Butte Valley (Link 280). Mitigation (discussed at the beginning of this section) would be expected to reduce the impacts from increased public access along this segment of Route B to insignificant levels. A total of 11.1 miles of high residual impact would be expected to persist from the construction and operation of the transmission line in the vicinity of Antone Pass (Link 280). Most of these high residual impacts would be associated with sage grouse leks (refer to discussion above regarding raptor predation).

From the Robinson Summit substation site to the Dry Lake substation site, the potential impacts of Route B would be the same as those described for Route A.

Vegetation/Sensitive Plant Species - Generally, the plant species described along the assumed centerline of Route A would be the same as those for Route B. One species of cactus, Sclerocactus pubispinus, occurs within one mile of the centerline of the section of this route along the eastern foothills of the Toano Range and Goshute Mountains (Link 222). It is often collected for horticultural purposes and may be impacted by increased public access. Suitable habitat for this species extends to areas on the centerline where ground disturbance could directly impact habitat and populations. This plant species is protected by the Cactus and Yucca Law in Nevada, which requires that permits be obtained from the Division of Forestry for removal of any plants.

Route C

Wildlife - From Midpoint Substation to Jackpot, Nevada (Links 10, 20, 40, 41, 50, 70), potential impacts to wildlife for Route C would be the same as described for Route A. From Jackpot to the southern end of Toano Draw north of Interstate 80 (Links 91, 92, 140, 141, 142, 144, 200), potential impacts to wildlife for Route C would be the same as described for Route B.

Then, from north of Interstate 80 in Toano Draw to the Dry Lake substation site, potential impacts to wildlife for Route C would be the same as described for Route A.

Vegetation/Sensitive Plant Species - Potential impacts to sensitive plants for Route C would be the same as discussed for Route A, except for impacts described for Arabis falcifructa (Link 162).

Route D

Wildlife - From Midpoint Substation to Jackpot, Nevada (Links 10, 20, 40, 41, 50, 70), potential impacts to wildlife for Route D would be the same as described for Route A. Potential impacts to wildlife for Route D, from Jackpot to northwest of the Windermere Hills (Links 72, 101, 102, 110, 130, 160, 161, 162), would also be the same as described for Route A.

From the Windermere Hills to Dolly Varden in Goshute Valley (Links 1611, 166, 167, 1613, 180, 190, 230), initial impacts to wildlife resources for Route D from potentially increased public access and ground disturbance would be generally low or indiscernible. Some potential high initial impacts would occur in pronghorn winter range west of HD Summit in the Bishops Creek area (Link 1611). Because of the relatively good access along this segment of this route, other impacts from increased public access would be low or indiscernible. In addition, some other high initial impacts would occur further south in Bishops Creek (Link 167). There would also be some moderate to high initial impacts to sage grouse leks and pronghorn winter range in this area (Link 166). Potential high initial impacts to sage grouse leks and long-billed curlew habitat would also occur along the western toe of the Wood Hills (Link 180). Where this segment of Route D would cross Independence Valley to the Pequop Mountains (Link 190), there would be some moderate initial impacts to long-billed curlew, sandhill crane, and key deer winter habitat.

Mitigation (discussed at the beginning of this section) would be expected to reduce potential high initial impacts from increased public access to moderate or low residual impacts. Potential high impacts to sage grouse leks would be expected to remain high following mitigation in Clover Valley (between mileposts 17.6 and 18.7) along the western toe of the Wood Hills (Link 180). Other residual impacts for this segment of the route would be expected to be moderate to low.

Federal and state biologists are concerned that the SWIP would add yet another cumulative impact on sage grouse populations in southern Idaho and eastern Nevada (refer to cumulative effects section at the end of Chapter 4). Concern has focused on the increase in public access within sage grouse habitats, placement of towers and access roads in strutting or crucial wintering grounds, and the fact that predators of sage grouse (e.g. golden eagles) use the transmission towers as hunting perches. Adult and immature birds and nests are all thought to be vulnerable. Because there is no way to mitigate predation of sage grouse in these areas, these impacts would remain high even after mitigation and would be long term and significant. Also, eliminating access would be difficult, and there would be some potential for disturbance and poaching in addition to the loss of habitat and disturbance due to construction activities.

From the Dolly Varden area to the North Steptoe substation site, Route D would result in some moderate and high initial impacts at the north end of the Steptoe Valley near Currie, Nevada (Link 241). These impacts would be associated with significant access increases in important pronghorn antelope habitat, long-billed curlew and sandhill crane habitat, Bonneville cutthroat trout habitat, and sage grouse leks. Other potential impacts in the Steptoe Valley would be expected to be moderate to low, with some high impacts. There would be high initial impacts to sage grouse leks, critical pronghorn habitat, and habitat of sandhill crane and long-billed curlew for approximately 11.5 miles in the northern portion of Steptoe Valley (Link 241) and for 0.1 miles where the route would cross Steptoe Valley (Link 243).

Following mitigation (discussed at the beginning of this section), potential high initial impact levels from increased public access and ground disturbing activities along this segment of Route D would be reduced to moderate or low residual (insignificant) impacts. Approximately 1.1 miles of high residual impacts would be expected to sage grouse leks that

occur (mileposts 28.3 to 29.4) in the northern portion of Steptoe Valley (Link 241) (refer to discussion above for long-term predation impacts to sage grouse).

From the North Steptoe substation site to the Dry Lake substation site, potential impacts to wildlife for Route D would be the same as described for Route A.

Vegetation/Sensitive Plant Species - The potential for impacts to occurrences of unique plant communities and/or sensitive plants on Route D would be the as same as that described for Route A.

Route E

Wildlife - From Midpoint Substation to Jackpot, Nevada, potential impacts to wildlife for Route E would be the same as described for Route A. From Jackpot to northwest of the Windermere Hills (Links 72, 101, 102, 110, 130, 160, 161, 162), potential impacts to wildlife for Route E would be the same as described for Route A. Then, from the northwest of the Windermere Hills to north of Interstate 80 near Oasis, Nevada (Links 1612, 152, 200), potential impacts to wildlife for Route E would also be the same as described for Route A.

Continuing from the north of Interstate 80 near Oasis, Nevada to the North Steptoe substation site (Links 221, 222, 224, 226, 259, 261), potential impacts to wildlife for Route E would be the same as described for Route B.

From the North Steptoe substation site to the Robinson Summit substation site (Links 270, 291, 293, 310), potential impacts to wildlife for Route E would again be the same as described for Route A. Then, from the Robinson Summit substation site to the Dry Lake substation site, potential impacts to wildlife for Route E would also be the same as described for Route A.

Vegetation/Sensitive Plant Species - The potential for impacts to occurrences of unique plant communities and/or sensitive plants on Route E, from Midpoint Substation to north of Interstate 80, would be the as same as those described to Route A. From north of Interstate 80 to the North Steptoe substation site, the potential for impacts to occurrences of unique plant communities and/or sensitive plants for Route E would be the as same as that described for Route B. Then, from the North Steptoe substation site to the Dry Lake substation site, Route E would again be the same as described for Route A.

Route F

Wildlife - From Midpoint Substation to Jackpot, Nevada (Links 61, 62, 64, 70), approximately 1.3 miles of high initial impacts occur to pronghorn habitat and long-billed curlew nesting areas from where Route F would traverse areas of open range east of Hagerman, Idaho (Link 61). In addition, considerable moderate initial impacts associated with pronghorn habitat and sage grouse leks would result in plateau areas along Salmon Falls Creek Canyon (Link 64). Ground disturbing activities and increased public access in the area east of Hagerman (Link

61) would result in mostly moderate initial impacts. In the plateau areas along Salmon Falls Creek Canyon (Link 64) initial impacts would vary from low to moderate. Wildlife species that would be affected include pronghorn, burrowing owl, long-billed curlew, pheasant, and sage grouse leks.

Following mitigation (discussed at the beginning of this section), no high residual impacts would be expected to remain along this segment of the Route F.

From Jackpot to the north of Interstate 80 near Oasis, Nevada (Links 72, 91, 92, 140, 141, 142, 144), potential impacts to wildlife for Route F would be the same as described for Route B. Then, from north of Interstate 80 near Oasis, Nevada to the Dry Lake substation site, potential impacts to wildlife for Route F would be the same as described for Route A.

Vegetation/Sensitive Plant Species - From Midpoint Substation to Jackpot, Nevada (Links 61, 62, 64, 70), six sensitive plant species would be directly impacted by ground disturbance where they would occur along 4.2 miles of the assumed centerline on plateau areas above the Snake River (Links 61, 62) and along Salmon Falls Creek Canyon (Links 64, 70).

Two of the species that would be effected by the route are federal candidate species (C2). Astragalus atratus var. inseptus (also a BLM sensitive species) occurs along the route near Peters Gulch (Link 70) and Lepidium davisii on the plateau above Salmon Falls Creek Canyon (Link 64). Populations of A. tetrapterus also occur over a two square mile area along Salmon Falls Creek (Link 64) and Allium anceps occurs in the foothills west of Jackpot (Link 70). Both are Priority 2 species in the State of Idaho. One candidate species, Castilleja salsuginosa, and two watch species in Nevada, Astragalus calycosus var. monophyllidius and Arenaria stenomeres, occur within a one mile area and may experience indirect impacts (refer to discussion under Route A).

From Jackpot, Nevada, to the Dry Lake substation site, the potential for impacts to occurrences of unique plant communities and/or sensitive plants for Route F would be the same as that described for Route A.

Route G

Wildlife - From Midpoint Substation to Jackpot, Nevada, potential impacts to wildlife for Route E would be the same as described for Route A.

From Jackpot to northwest of the Windermere Hills, moderate to high initial impacts would be expected to occur where Route G would traverse crucial mule deer and pronghorn winter habitat, bald eagle nesting and wintering habitat and sage grouse leks and wintering grounds in the rolling hills between Jackpot and Contact (Links 711, 714). In addition, increased public access and ground disturbing activities would result in some high initial impacts to crucial mule deer and pronghorn habitats, and bald eagle nesting and wintering habitats in this area (Links 101, 713, 715). No high residual impacts would be expected to occur along this segment of Route G following the mitigation.

North of the Windermere Hills near Wilkins, Nevada (Link 150) in the Thousand Springs Valley, initial impacts would be moderate to high where pronghorn winter range and sage grouse leks occur along the assumed centerline. There would be some high initial impacts to sage grouse leks on the northern end of Link 151. Initial impacts on Link 150 would be moderate to high. Following mitigation there would be no high residual impacts expected to occur along this segment of Route G, except for the long-term significant impacts to sage grouse.

Federal and state biologists are concerned that the SWIP would add yet another cumulative impact on sage grouse populations in southern Idaho and eastern Nevada (refer to cumulative effects section at the end of Chapter 4). Concern has focused on the increase in public access within sage grouse habitats, placement of towers and access roads in strutting or crucial wintering grounds, and the fact that predators of sage grouse (e.g. golden eagles) use the transmission towers as hunting perches. Adult and immature birds and nests are all thought to be vulnerable. Because there is no way to mitigate predation of sage grouse in these areas, these impacts would remain high even after mitigation and would be long term and significant. Also, eliminating access would be difficult, and there would be some potential for disturbance and poaching in addition to the loss of habitat and disturbance due to construction activities.

From the Windermere Hills to Dolly Varden (Links 200, 211, 212, 230), potential impacts to wildlife for Route G would be the same as described for Route A. Then, from Dolly Varden to the North Steptoe substation site (Links 241, 243, 245), potential impacts to wildlife for Route G would be the same as described for Route D.

From the North Steptoe substation site to the Robinson Summit substation site (Links 270, 280, 310), potential impacts to wildlife for Route G would be the same as described for Route B. Then, from the Robinson Summit substation site to the Dry Lake substation site, potential impacts to wildlife for Route G would again be the same as described for Route A.

Vegetation/Sensitive Plant Species - Arabis falcifructa, a C2 species, occurs within one mile the assumed centerline of Route G in Thousand Springs Valley (Link 151). This plant would not be impacted if access to the right-of-way is adequately controlled. Other sensitive plant species potentially impacted along Route G are described under Route A (Links 41, 70, 670, 700).

Alternative Routes - Ely to Delta

Direct Route

Wildlife - In Nevada, from the North Steptoe substation site to the Little Hills (Links 262, 263, 265, 266), increased public access and ground disturbing activities would generally cause low to moderate impacts. High initial impacts would occur for approximately 1.0 mile in Antelope Wash (Link 266) where increases in public access would be significant in areas of crucial pronghorn winter habitat and ferruginous hawk habitat. Mitigation measures (described at the beginning of this section) would reduce these impacts to insignificant levels.

Moderate initial impacts would also be expected along this route in the Schell Creek Range (Links 262, 263, and 620). There would be high initial impacts for approximately 1.0 mile where sage grouse leks occur at the northern end of Spring Valley (Link 263). Approximately 2.6 miles of high initial impacts in sage grouse winter grounds would be expected to occur (between mileposts 3.0 and 5.0), where this route would cross Spring Valley (Link 266). About 2.1 miles of high residual impacts to wintering bald eagle use areas would be expected to occur in the valley east of the Little Hills (Link 620). Also on Link 620, this route would result in high initial impacts from ground disturbance to bald eagle wintering areas for approximately 2.1 miles.

Further east, the Direct Route would cross the Snake Valley, Tule Valley, and Swasey Bottom (Links 621, 630, 640) in Utah. Initial impacts would generally be low, moderate, and indiscernible in the vicinity of Delta (Links 572, 580, 581, 582). High initial impacts would occur for approximately 3.6 miles from increased public access in the vicinity of the Leland-Harris Spring Complex (Link 630), where four federal candidate species (least chub, spotted frog, desert dace, and Great Basin silver-spot butterfly) are known to occur. High residual impacts from increased public access to the Leland-Harris Spring Complex would remain due to the potential long-term and cumulative effects of repeated public entry to this sensitive area. BLM biologists are concerned that any direct impacts from construction activities or indirect, long-term impacts from increased public accessibility could endanger the survival of these sensitive species. Crossing of the Leland-Harris Spring Complex area would also require a permit under Section 404 of the Clean Water Act (1972) if any filling were to occur within jurisdictional wetland areas.

Except for the impacts to sage grouse leks (Links 263, 266, and 620) and the potential impacts to the Leland-Harris Spring Complex (Link 620), committed mitigation measures (described in the beginning of this section) would effectively mitigate these high initial impacts to insignificant levels. Residual impacts to sage grouse would be adverse, long term, and significant despite mitigative measures. Federal and state biologists are concerned that the SWIP would add yet another cumulative impact on sage grouse populations in southern Idaho and eastern Nevada (refer to cumulative effects section at the end of Chapter 4). Concern has focused on the increase in public access within sage grouse habitats, placement of towers and access roads in strutting or crucial wintering grounds, and the fact that predators of sage grouse (e.g. golden eagles) use the transmission towers as hunting perches. Adult and immature birds and nests are all thought to be vulnerable. Because there is no way to mitigate predation of sage grouse in these areas, these impacts would remain high even after mitigation and would be long term and significant. Also, eliminating access would be difficult, and there would be some potential for disturbance and poaching in addition to the loss of habitat and disturbance due to construction activities.

Initial high impacts to critical deer winter range and pronghorn habitat would occur for 0.7 miles from increased public access south of the Drum Mountains (Link 640). Mitigation measures (discussed in the beginning of this section) would effectively mitigate these impacts to insignificant levels.

Vegetation/Sensitive Plant Species - No known populations of sensitive plant species or communities are known to occur along the Direct Route.

Cutoff Route

Wildlife - From the North Steptoe substation site to the Little Hills (Links 262, 263, 265, 266), this route would result in the same potential impacts to wildlife as described for the Direct Route.

Impacts from increased public access and ground disturbance activities along the remainder of the Cutoff Route (Links 267, 268, 462, 470, 540, 571, 572, 580, 581, 582) would be to pronghorn, mule deer, bald eagles, sage grouse leks and sage grouse wintering grounds. In the northern portion of the Snake Valley (Link 267), high initial impacts would occur in pronghorn winter range, sage grouse leks, and bald eagle habitats. Further south in the Snake Valley (Link 268), the route would result in a total of approximately 2.2 miles of high initial impacts to crucial pronghorn habitat and key deer winter range, as well as one golden eagle nest location. Approximately 0.5 miles of high initial impact would occur where public access would increase significantly in critical deer and antelope winter range further south in the Snake Valley (Link 268). This route would result in another 2.4 miles of high initial impact to key deer winter range and migration corridors (between mileposts 21.3 to 23.6) in the Confusion Range (Link 462). Mitigation measures (discussed in the beginning of this section) would effectively mitigate these impacts to insignificant levels, except for the adverse and significant impacts to sage grouse leks on Link 267.

Federal and state biologists are concerned that the SWIP would add yet another cumulative impact on sage grouse populations in southern Idaho and eastern Nevada (refer to cumulative effects section at the end of Chapter 4). Concern has focused on the increase in public access within sage grouse habitats, placement of towers and access roads in strutting or crucial wintering grounds, and the fact that predators of sage grouse (e.g. golden eagles) use the transmission towers as hunting perches. Adult and immature birds and nests are all thought to be vulnerable. Because there is no way to mitigate predation of sage grouse in these areas, these impacts would remain high even after mitigation and would be long term and significant. Also, eliminating access would be difficult, and there would be some potential for disturbance and poaching in addition to the loss of habitat and disturbance due to construction activities.

Approximately 3.5 miles of initial high impacts to critical pronghorn habitat, key deer winter range, and deer migration routes would occur in the Confusion Range (Link 462). In addition, the route would result in approximately 0.3 miles of high initial impact to pronghorn habitat in Whirlwind Valley (Link 470). No other high initial impacts would be expected to occur on the Cutoff Route. Mitigation measures (described at the beginning of this section) would be expected to effectively reduce these high impacts to insignificant levels.

Vegetation/Sensitive Plant Species - No known populations of sensitive plant species or communities occur along this alternative.

230kV Corridor

Wildlife - From the Robinson Summit substation site to the Buckskin Hills, initial impacts along the 230kV Corridor Route from increased public access and ground disturbing activities would generally be moderate with scattered areas of high impact. On Link 350, 1.1 miles of initial high impacts would result because of sage grouse leks. Initial high impacts on Link 351 are associated with sage grouse leks and long-billed curlew habitat (0.8 miles), ferruginous hawk nests and habitat, sage grouse winter grounds, long-billed curlew and sandhill crane habitat (approximately 2.1 miles).

Link 370 has approximately 4.5 miles of potentially high initial impacts as a result of the presence of ferruginous hawk nests and habitat, long-billed curlew and sandhill crane habitat, and bald eagle wintering grounds. On Link 380, a total of approximately 9.4 miles of high initial impacts would be expected due to the presence of ferruginous hawk nests and habitat, sage grouse leks, long-billed curlew habitat, bald eagle wintering areas, elk and deer summer range, and crucial elk winter range.

A total of approximately 1.6 miles of high initial impacts to key habitat areas for elk, critical pronghorn habitat, key deer winter range, (key) water source, and nesting areas for ferruginous hawks, bald eagles, and long-billed curlews would occur where the route crosses the southern end of the Schell Creek Range (Link 380) on the Humboldt National Forest and traverses the Snake Valley (Link 461). Initial high impacts on Link 462 (approximately 3.5 miles) would be reflected by the presence of critical pronghorn habitat, key deer winter range, and a deer migration area. There would be 0.3 miles of potential high initial impact associated with Link 470 (critical pronghorn habitat). No other high initial impacts from increased public access would be expected on the 230kV Corridor route.

Applying mitigation would result in only 0.1 miles of high residual impact to wildlife on the 230kV Corridor. Moderate residual impact persists in the Schell Creek Range (Link 380) where potential public access to long-billed curlew and ferruginous hawk habitat would increase significantly. With mitigation, most high initial impacts would be expected to be reduced to low or indiscernible for most of the route.

From the Buckskin Hills, in Utah, to the Intermountain substation site (Links 462, 470, 540, 571, 572, 580, 581, and 582), potential impacts to wildlife for the 230kV Corridor Route would be same as those described for the Cutoff Route.

Vegetation/Sensitive Plant Species - No known populations of sensitive plants are known to occur along this alternative.

Southern Route

Wildlife -The Southern Route originates at the Robinson Summit substation site and traverses south through Jakes Valley. Increased public access and ground disturbing activities would result in a total of approximately 54 miles of high initial impacts. On Link 364, approximately 12.1 miles of high initial impact would be attributable to the presence of

sage grouse leks on the route. Federal and state biologists are concerned that the SWIP would add yet another cumulative impact on sage grouse populations in southern Idaho and eastern Nevada (refer to cumulative effects section at the end of Chapter 4). Concern has focused on the increase in public access within sage grouse habitats, placement of towers and access roads in strutting or crucial wintering grounds, and the fact that predators of sage grouse (e.g. golden eagles) use the transmission towers as hunting perches. Adult and immature birds and nests are all thought to be vulnerable. Because there is no way to mitigate predation of sage grouse in these areas, these impacts would remain high even after mitigation and would be long term and significant. Also, eliminating access would be difficult, and there would be some potential for disturbance and poaching in addition to the loss of habitat and disturbance due to construction activities.

Link 420 would have 6.2 miles of high initial impact due to potential disturbance to ferruginous hawk nests, ferruginous hawk habitat, antelope kidding grounds, and long-billed curlew habitat. There would also be high initial impacts to key deer winter range on Link 430, and critical pronghorn habitat on Link 450. Link 451 would be characterized by a substantial 28.5 miles of potentially high initial impact associated with the presence of a number of sensitive features including critical pronghorn habitat, key deer winter range, important water sources, raptor nesting areas, and ferruginous hawk nests. Most of the initial high impacts on this link (23.0 miles) would be associated with important pronghorn habitat. There would be 0.5 miles of high initial impact on Link 490 associated with a known ferruginous hawk nest. In addition to these potentially high initial impacts, additional moderate effects to pronghorn, deer winter range, sage grouse leks, ferruginous hawk habitat and long-billed curlews would be anticipated.

Mitigation measures (described at the beginning of this section) would be expected to effectively reduce most of the high impacts along this route to insignificant levels, except for approximately 10.3 miles of high residual impacts would remain due to unavoidable, long-term, deleterious effects on sage grouse leks on Link 364 (refer to discussion above).

From the Smelter Hills substation site to the Intermountain substation site (Links 571, 572, 580, 581, and 582), potential impacts to wildlife would be the same as described for the Cutoff Route.

Vegetation/Sensitive Plant Species - Isolated areas of high initial impacts are expected in areas where five species of sensitive plants that occur along the centerline of this route would be directly impacted by ground disturbance. Two Category 2 species, Cryptantha compacta and Eriogonum ammophilum occur at the southern tip of the Tule Valley (Link 451). A third Category 2 species, Astragalus uncialis occurs in the Swasey Wash on Link 490. Penstemon nanus, an S3 species in Utah, has also been found along the centerline in the Tule Valley (Link 451). Sclerocactus pubispinus, a species protected by the Cactus and Yucca Law of Nevada occurs along the centerline near the southern end of the Snake Range (Link 430). This species, which is also a federal Category 3 candidate, also occurs on Link 451 in the Tule Valley of Utah.

Residual impacts to these species would be expected to be low following application of appropriate mitigation measures.

Populations of S. pubispinus, A. uncialis, Sphaeralcea caespitosa, Eriogonum eremicum, A. callithrix, and E. natum occur within one mile of the study corridor centerline in various areas. These plants, however, should not be directly impacted if access to the right-of-way is adequately controlled.

HUMAN ENVIRONMENT

Land Use Resources

Introduction

The primary issues associated with the construction of the proposed 500kV transmission line are expected to occur from the direct physical conflicts with land uses (e.g., agricultural operations, irrigation systems, airport clear zones, other utilities). A transmission line can also result in indirect land use impacts to quality of the recreation experience available to users of developed recreation sites and recreation areas (e.g., campgrounds, picnic areas, natural areas, wilderness study areas).

The potential adverse effects to land uses from the construction and operation of a transmission line related to the improvement of existing roads or construction of access roads, the physical presence of the line, and right-of-way encroachment are described in this section. In addition, this section also describes the potential effects of the SWIP on the land and resource management policies and land management plans of federal, state, and local agencies.

Methods

A resource sensitivity evaluation determined how susceptible the different land uses would be to changes that would result from the construction and operation of a 500kV transmission line. To determine the sensitivity of the inventoried land uses, the functional, social, and economic effects to each land use were considered.

Sensitivity is a measure of the probable adverse responses that a land use would have to the direct and indirect impacts associated with the construction and operation of the proposed transmission line. The adverse effects depend on three major criteria:

- the susceptibility of the land use to the potential changes caused by construction and operation activities
- the significance of the potential changes to the land use
- the local or regional importance of the land use

Once established, these sensitivity criteria were systematically applied to each land use. The degree or level to which each land use is sensitive to the introduction of a 500kV transmission line is dependent upon the relationship between the above criteria. The results of the resource sensitivity evaluation were used to determine potential impacts to land uses.

Using the impact assessment and mitigation planning process, the predicted effects of the proposed project were compared with the pre-project environment to determine the initial impacts on land use resources that would result from each alternative route. Generic and selectively recommended mitigation measures that would effectively reduce or eliminate impacts were then applied to initial impacts to determine the "residual" impacts of the SWIP on land use resources. The land use resources that were assessed include five major categories:

- land jurisdiction
- existing and planned land use
- parks, recreation, and preservation
- transportation and access
- mining claims and extractive uses

Initial impact levels were determined through a GIS model that described the location and magnitude of potential impacts. For a particular land use feature or area of affected resource, impacts were only assessed along the assumed centerline of each alternative route. The GIS impact assessment model assigned appropriate mitigation through a matrix to determine residual impacts. The GIS model generated maps and tabular reports to qualify and quantify initial impacts, recommended mitigation, and residual impacts in one-tenth mile increments along the centerline of each alternative route.

The data for the five land use categories are compiled in the data tables that accompany the technical report. The data tables show the milepost location of potential impacts, the access level (ground disturbance level), the land use feature or theme affected, the initial impact level, the recommended mitigation measure(s), and the residual impact level.

The high residual impacts that could significantly affect land use resources are described in the results section by alternative route. The following sections describe the impact types associated with the development of the proposed transmission line and summarize the mitigation measures that were recommended to reduce initial impacts. Refer to technical report for a detailed description of the impact assessment and mitigation planning process (refer to Appendix H for the locations where technical reports can be reviewed).

Impact Types

Impact types were identified by considering what effects the construction and operation of a 500kV transmission line and related facilities could have on the pre-project, or existing, environment. Inventoried land uses were evaluated to determine the types of the potential direct and indirect impacts that could occur along the assumed centerline routing alternatives.

The impact types identified for land use categories, mentioned previously, are characteristically direct and long-term, and include any impact that:

- displaces, alters, or otherwise physically affects any existing, developing or planned residential, commercial, industrial, governmental, or institutional use or activity
- displaces, alters, or otherwise physically affects any existing agricultural use or activity
- displaces, alters, or otherwise physically affects any area designated as suitable for timber production
- alters or otherwise physically affects any established, designated or planned park, recreation, preservation, or educational use area or activity
- affects applicable general and regional plans and/or approved, adopted, or officially stated policies, goals, or operations of communities or governmental agencies

Mitigation

Generic mitigation measures were applied to all affected areas (refer to Table 4-1). A set of selectively committed mitigation measures were applied, on a case-by-case basis where appropriate, to minimize potential initial high and moderate impacts levels identified during the first part of the impact assessment (refer to Table 4-2). Four of the mitigation measures from Table 4-2 were committed to in order to reduce potential land use impacts.

Two of these measures were designed to minimize the effects of new access road that would be built to access transmission tower construction sites by requiring that existing access be utilized where ever possible (#1) and by rehabilitating new access roads in remote areas following construction (#4). For localized effects or conflicts, measure #6 recommends that a potential conflict be avoided by adjusting the centerline. Where other linear features (e.g., roads, highways, canals, rivers) would be crossed, measure #8 would recommend that transmission line towers be placed at the maximum feasible distance from the crossing.

Results

No high residual impacts to land use resources were identified for any of the alternative routes described in this document.

Residual impacts to agricultural land uses are generally expected to be low. Specific locations of towers on agricultural lands would be negotiated with landowners during right-of-way acquisition, for the selected route. In addition, specific locations of transmission line

towers on private lands (e.g., ranch, range or pasture lands) would be negotiated between the utility and the landowner. Potential impacts from soil disturbance or compaction of soils on cultivated lands are expected to be short-term (e.g., during construction). Mitigation of potential operational conflicts with mechanized farm equipment and irrigation systems would also be negotiated with individual landowners during right-of-way acquisition.

Generally, the alternative routes would result in low to no identifiable impacts to range and range improvements. Potential impacts to fences, waterlines, and access rights-of-way can be easily mitigated by tower placement during engineering design and preconstruction activities for the SWIP. Because potential impacts can be mitigated, the impact assessment does not attempt to assign a level of impact to potential effects on range improvements. Potential impacts to range improvements would be specifically mitigated for the selected alternative route through the generic mitigation measures outlined in Table 4-1 and stipulations that will appear in the Construction, Operation, and Maintenance (COM) Plan to be developed prior to construction. Tables 4-3 and 4-3a list by alternative route and for each range allotment the name, total acreage, the approximate area of disturbance, and the approximate area of each allotment where "viable" forage cover would be disturbed. Viable forage cover was considered to be those land cover types that can sustain forage plant species. Of the 13 landcover types classified from Thematic Mapper satellite data, only basaltic flows, and water were considered non-viable (also refer to Landcover maps in Map Volume). The column in Table 4-3 and 4-3a labeled "Viable Acreage" indicates the area of a grazing allotment that would be temporarily taken out of production by ground disturbance.

All the alternative routes would cross mining claims. The total mileage of mining claims that would be crossed by each route is listed in Tables 2-4 and 2-5. The construction of the proposed transmission line would have no identifiable impact on mining claims. However, the presence of mining claims in the right-of-way could potentially affect the operation of the line if locatable minerals were discovered. In light of the recent trends in mining practices in Nevada toward heap-leach techniques, greater areas of land are covered by mining claims. The area below the right-of-way of the proposed transmission line would likely not result in significant loss of recoverable minerals. However, if a mining claim predates the right-of-way grant for the transmission line, and the claimant wants to reach what is believed to be a rich ore deposit, the right-of-way holder (the utility) would have to move the transmission line or negotiate an acceptable monetary payment for the mineral rights.

No high residual impacts to the quality of recreation experience available in parks, recreation, and preservation areas are expected as a result of the any of the alternative routes. Potential impacts to recreation users and their experience are expected to be somewhat lower where an alternative route would parallel an existing transmission line. However, cumulative effects of multiple transmission lines in a corridor would eventually result in greater adverse impacts.

Generally, impacts to the recreation experience result from impacts to the scenic or aesthetic qualities of the surrounding landscape (refer to Visual Resources). Because no Wilderness or WSAs would be crossed or otherwise directly affected, the potential impacts to the recreation experience in these areas is associated with the visual effects of the SWIP as seen from viewpoints within the boundaries of these areas.

Potential impacts would be reduced by selectively applying mitigation where appropriate. Construction access roads would be placed to avoid impacts to highways, trails, and recreation sites and areas, where possible. The use of existing roads and overland access, where possible, to construct the proposed project would effectively reduce any potential land use impacts.

Alternative Routes Midpoint to Dry Lake

Route A

No high residual impacts to land use resources are expected to occur along this route. Approximately 21.4 miles of irrigated prime and unique farmland and 16.8 miles of other agricultural lands would be crossed by this route. Specific tower placement and centerline position (e.g., along section lines, roads, etc.) would reduce the potential impacts to farm operations and agricultural production to low. The presence of a transmission line can be hazardous to aerial crop spraying operations and typically increase costs to farmers when they cross agriculture lands. The additional amounts of pesticides generally needed to cover the areas around transmission line are often charged directly to the farmer.

From the Midpoint Substation to Jackpot, some low and moderate residual impacts would result where the route would cross parks, recreation, or preservation sites or areas including the Minidoka Relocation Center Interpretive Site north of Eden (Link 20), the Oregon Trail (Link 41) southwest of Murtaugh, and the Salmon Falls Creek Reservoir Special Recreation Management Area (SRMA) located east of Browns Bench (Links 50, 64, 70). The Salmon Falls Creek SRMA, in Nevada, would also be crossed west of Jackpot (Link 711).

From Jackpot to the North Steptoe substation site, the route would cause some indirect impacts to recreation users where this route would cross the California National Study Trail adjacent to West Bush Creek (Link 1612). The California Trail Scenic Back Country Byway, the Pony Express Trail south of Cherry Creek Station (Link 291), and U.S. Highway 93, designated a scenic highway, in Dry Lake Valley west of Caliente (Link 675) (refer to Visual Resources section).

Route A would result in a total of 64.1 miles of moderate impacts to military operating areas (MOAs), where the portion of each route, from the Ely area to Dry Lake are common (Links 672, 673, 675, 690) in southern Nevada. The construction and operation of the proposed 500kv transmission line in these MOAs would have potentially direct conflicts with low level flight training operations in these areas. Nellis Air Force Base (AFB) has expressed concerns that the height and location of towers could interfere with low-level flying and would be potentially hazardous to pilots. In addition, the Air Force would have to alter flight plans and established training exercises.

In addition, moderate impacts are expected to result where Route A would pass through the edge of the clear zone of two unpaved utility airstrips along this segment of the route. The route would pass parallel one mile to the east of an airstrip located west of Caliente at the southern end of Delamar Valley (Link 671) near U.S. Highway 93. The route would pass

parallel and adjacent to another airstrip located in Delamar lake bed of the southern portion of Delamar Valley (Link 690).

Route B

From Midpoint Substation to Jackpot, potential impacts to land use resources for Route B would be the same as those described for Route A. No high residual impacts are expected to occur along this route.

From Jackpot to the North Steptoe substation site, this route would result in indirect impacts to the recreation experience including the California National Study Trail and the California Trail Scenic Back Country Byway in Thousand Springs Valley (Link 140) and to the California National Study Trail in the Toano Draw (Link 222) (refer to Visual Resources section). Route B would result in approximately 11.5 miles of moderate residual impacts to the R-6405 Restricted Area (Links 222, 224, 226) operated by Hill AFB. Transmission towers would cross the northwest corner of this restricted military air space and could interfere with low-level flying operations.

From North Steptoe substation site to the Dry Lake substation site, potential impacts to land use resources for Route B would be the same as those described for Route A.

Route C

From Midpoint Substation to Jackpot, potential impacts to land use resources for Route C would be the same as those described for Route A. No high residual impacts are expected to occur along this route.

From Jackpot to the North Steptoe substation site, there would be indirect impacts to the recreation experience of users where the route would cross the California National Study Trail and the California Trail Scenic Back Country Byway in Thousand Springs Valley (Link 140), the California National Study Trail, crossed southeast of Oasis (Link 211) and again south of Shafter (Link 212) (refer to Visual Resources section).

From North Steptoe substation site to the Dry Lake substation site, potential impacts to land use resources for Route C would be the same as those described for Route A.

Route D

From Midpoint Substation to Jackpot, potential impacts to land use resources for Route D would be the same as those described for Route A. No high residual impacts are expected to occur along this route.

From Jackpot and the North Steptoe substation site, Route D would result in some indirect impacts where it crosses portions of the California National Study Trail adjacent to Flats Creek (Link 170), in the vicinity of Wells (Links 170), and in the Pequop Mountains (Link 190) (refer to Visual Resources section).

From North Steptoe substation site to the Dry Lake substation site, potential impacts to land use resources for Route D would be the same as those described for Route A.

Route E

From Midpoint Substation to Jackpot, potential impacts to land use resources for Route E would be the same as those described for Route A. No high residual impacts are expected to occur along this route.

From Jackpot to the North Steptoe substation site, this route would cause some moderate impacts to the experience of recreation users where the route would cross portions of the California National Study Trail in Goshute Valley (Link 222) and adjacent to West Bush Creek (Link 1612) (refer to Visual Resources section).

Route E would result in approximately 11.5 miles of moderate residual impacts to the R-6405 Restricted Area (Links 222, 224, 226) operated by Hill AFB. Transmission towers could interfere with low-level flight operations where this route would cross the northwest corner of this military air space.

From North Steptoe substation site to the Dry Lake substation site, potential impacts to land use resources for Route E would be the same as those described for Route A.

Route F

From Midpoint Substation to Jackpot, Nevada, this route would result in approximately 32.0 miles of low impacts to irrigated prime and unique farmland and 22.0 miles of other agricultural lands crossed by this route. However, specific tower placement and centerline position (e.g., along section lines, roads) would mitigate potential impacts to farm operations and agricultural production.

Route F would cause indirect impacts to the recreation experience of users of the Oregon Trail east and southeast of Hagerman (Links 61, 64) the Hagerman Fossil Beds National Monument (Link 64), the Salmon Falls Creek Reservoir SRMA east of Browns Bench (Links 64, 70), and the Snake River Rim Recreation Area (Link 61) (also refer to Visual Resources section).

Moderate impacts would be expected to result where this route would pass through the edge of the clear zone of an unpaved utility airstrip that is used by crop dusters during agricultural spraying operations near Hagerman (Link 64).

From Jackpot to the North Steptoe substation site, indirect impacts to the recreation users would result where the route would cross the Salmon Falls Creek SRMA in the foothills southwest of Jackpot (Link 72), the California National Study Trail, southeast of Oasis (Link 211) and again south of Shafter (Link 212), and the California Trail Scenic Back Country Byway in Thousand Springs Valley (Link 140) (refer to Visual Resources section).
From the North Steptoe substation site to the Dry Lake substation site, potential impacts to land use resources for Route F would be the same as those described for Route A.

Route G

From Midpoint Substation to Jackpot, potential impacts to land use resources for Route G would be the same as those described for Route A. No high residual impacts are expected to occur along this route.

From Jackpot to the North Steptoe substation site, indirect impacts to the recreationists would be expected to occur where this route would cross the California National Study Trail in Thousand Springs Valley (Link 151), southeast of Oasis (Link 211), and south of Shafter (Link 212). There would be similar indirect impacts where this route would cross the California Trail Scenic Back Country Byway in Thousand Springs (Link 151).

From North Steptoe substation site to the Dry Lake substation site, potential impacts to land use resources for Route G would be the same as those described for Route A.

Alternative Routes Ely to Delta

Direct Route

No high residual impacts to land use resources are expected to occur along this route.

The route would result in a total of 57.3 miles of moderate residual impacts to the R-6045 Restricted Area (Link 630) and would cross 46.9 miles through portions of the Gandy, Sevier A, and Sevier B military operating areas (MOAs) (Links 572, 580, 620, 621, 630, 640). These areas are part of the Utah Testing and Training Range (UTTR) operated by Hill AFB. The construction and operation of the proposed 500kv transmission line in these MOAs would have potentially direct conflicts with low level flight training operations in these areas. Hill AFB has expressed concerns that the height and location of towers in the MOAs or in the R-6405 Restricted Area could interfere with low-level flying and would be potentially hazardous to pilots. Further, the Air Force would have to alter flight plans and established training exercises.

Potential conflicts are expected to be minimized through the use of shorter towers in critical areas. The Project Sponsor has negotiated locations for shorter towers in negotiations with Hill AFB. These locations are indicated in the column labeled "Recommended Mitigation" in the technical reports (refer to Appendix H for the locations where technical reports can be

reviewed). In the R-6405 Restricted Area, Hill AFB has stated that 30-foot-2 high towers would be required to avoid potential conflicts with low-flying aircraft. The minimum ground clearance for a 500kV transmission line would make this impractical.

Cutoff Route

No high residual impacts to land use resources would be expected along this route. Indirect impacts would occur where this route would cross the Pony Express Trail in the Spring Valley Creek area near Stonehouse (Link 265) (refer to Visual Resources section).

This route would result in approximately 123.0 miles of low residual impacts to portions of the Gandy, Sevier A, and Sevier B MOAs (Links 265, 267, 268, 462, 470, 540, 571, 572, 580) portion of the UTTR. This route would also pass through the southwest corner of the R-6405 Restricted Area for approximately 2 miles (Link 267). The mitigation of using shorter towers is expected to reduce moderate initial impacts and result in low residual impacts. Like the Direct Route, locations along the Cutoff Route for shorter towers have been determined in negotiations with Hill Air Force Base.

230kV Corridor Route

No high residual impacts to land use resources would be expected along this route. There would be approximately 1.2 miles of moderate initial impacts to irrigated prime and unique farmland where the route would cross agriculture lands in the vicinity of Delta (Links 540, 571, 572, 580, 581, 582). Specific tower placement would effectively mitigate the direct impacts to farm operations and agricultural production.

Indirect impacts to the experience of recreation users would occur where this route would cross Success Loop southeast of Ely, Nevada (Link 380), which also serves as a main access road to Cave Lake State Recreation Area and into the Humboldt National Forest. Similar impacts would also result to the recreation users of Silver Creek Road, a recreation destination road that provides primary access (Link 460) to the Mount Moriah Wilderness Area from U.S. Highway 50 (refer to Visual Resources section).

Similar to the Cutoff Route, this route would result in a total of about 79.0 miles of low impacts to portions of the Sevier A and Sevier B MOAs (Links 462, 470, 540, 571, 572, 580), part of the UTTR. Using shorter towers would effectively mitigate the initial impacts. Locations for shorter towers have been determined in negotiations with Hill AFB.

Southern Route

No high residual impacts to land use resources would be expected to occur along this route. This route would result in indirect impacts to recreation users of the proposed Horse and Cattle Camp Backcountry Byway in southern end of the Steptoe (Link 364) and the roads that

provide access to the Mt. Grafton (Link 364), Fortification Range (Link 420), King Top (Link 451), and Notch Peak (Link 451) WSAs (refer to Visual Resources section).

The route would cause a total of approximately 102.5 miles of low residual impacts to portions of the Sevier A and Sevier B MOAs (Links 450, 451, 490, 510, 560, 571), part of the UTTR. Using shorter towers would mitigate impacts to low. Locations along this route for shorter towers have been determined in negotiations with Hill AFB.

Visual Resources

Introduction

Visual resource impacts would result from the construction, operation, and maintenance of the proposed SWIP 500kV transmission line. Specifically, the impacts would be caused from the line being seen from sensitive viewpoints and from the effects to the aesthetic values of the landscape. Impacts to views are the highest when viewers are identified as being sensitive to change in the landscape, and their views are focused on and dominated by the change. Visual impacts occur when changes in the landscape are noticeable to viewers looking at the landscape from their homes or from parks, recreation and preservation areas, highways and travel routes, and important cultural features and historic sites.

Methods

The visual resource inventory for the SWIP study corridors consisted of the following components (also refer to Chapter 3):

- landscape character types and physiography
- scenic quality/variety class
- sensitive viewpoints
- visibility from sensitive viewpoints
- distance zones/visibility thresholds
- visual management classes (VRM/VQO)

The existing visual condition of the landscape that would be affected by the alternative routes is described by these components. The visual impacts that would result from the construction and operation of a 500kV transmission line are usually direct, adverse, and long-term. This analysis considered the potential impacts of changes in the landscape on:

- views from residences
- views from parks, recreation, and preservation areas
- views from travel routes
- views from sensitive cultural sites (e.g., historic landmarks)

- the quality of scenic or natural aesthetic resources
- compliance with agency visual resources management objectives

The impact assessment is based on the guidelines in the BLM's Visual Resources Management 8400 Series (BLM 1986) and the Forest Service (FS) visual resource management systems (VMS) Chapter 2 (FS 1974). The methods and procedures described in these documents guided the collection of the visual resource inventory and were adapted to address the specific visual issues related to the construction, operation, and maintenance of the SWIP.

The visual analysis was conducted using a GIS to model the seen area, to derive maps and data tables, and document the effects of the proposed project. Several of the inventory maps were derived through computer models that utilized other available data in the system. For example, to determine project visibility from sensitive viewpoints, viewshed mapping was derived through a GIS computer model that "looked out" from selected viewpoints over terrain modeled from USGS digital elevation terrain to establish what portion of the landscape would be visible from a particular viewpoint. This model and the visual contrast model are referred to as pre-assessment models (refer to the Objectives, Procedures, and Results and the technical reports for further explanation of the GIS models).

Photo simulations - Important views and areas where issues of potential visual impacts were of high concern were further evaluated using photographic simulations techniques. Simulations were used to evaluate the accuracy of the predicted visual impacts, to determine the effectiveness of recommended mitigation, and to illustrate the expected impacts to the concerned agencies and the public. Some of these simulations are in the Map Volume. The viewpoints for which simulations were prepared include:

- Minidoka Relocation Center National Historic Site - views from a site on the National Register of Historic Places (Link 20), where Americans of Japanese descent were interned during World War II

- Contact - the potential visual effects of the crossing of U.S. Highway 93 (Link 102) by the SWIP parallel to two existing transmission lines north of Contact, Nevada

- Contact to Jackpot - view of the SWIP and two existing transmission lines parallel to U.S. Highway 93 (Link 101) between Contact and Jackpot, Nevada

- North Steptoe substation site - the view west from U.S. Highway 93 at a proposed alternative substation site in North Steptoe Valley is shown in this simulation

- Cave Lake State Recreation Area - the view of the SWIP crossing of the entrance road (Link 380) into the Cave Lake State Recreation Area (part of the Success Loop, a scenic route)

- Oasis - a view of the proposed SWIP transmission line crossing of the Interstate 80 (Link 211) near Oasis, Nevada, where the BLM has designated a low visibility corridor along Interstate 80

- Lake Valley Summit - the view from a proposed interpretive site for Great Basin National Park on Utah State Highway 21 (Link 451)

- Sacramento Pass - two photosimulations were prepared for this viewpoint illustrating the effects of self-supporting steel lattice towers and H-frame towers to views of Wheeler Peak from U.S. Highway 6/50 (Link 460)

- Great Basin National Park visitor center - the view of the SWIP where it would parallel a pair of existing 230kV transmission lines (Link 461) across the Snake Valley (the computer-based perspective drawing demonstrated that transmission line towers would be almost imperceptible at the viewing distance of 20+ miles)

- Bristol Wells - the view of the proposed SWIP transmission line from Bristol Wells (Link 674), a site on the National Register of Historic Places.

- Pahranagat Wash - the view south on U.S. Highway 93 (Link 690) near the Pahranagat Wildlife Refuge

These photo simulations were created using a combination of computer drawing techniques and hand rendering. Accurate perspective drawings of the proposed transmission line were completed using a computer. These drawings were combined with a three-dimensional model of the topography of the landscape created by computer to create an accurate representation of the scale and perspective of the transmission line as it would be seen from the viewpoint. The composite drawings guided the rendering of the transmission line and physical changes in the landscape directly onto photographs of a view. Renderings, using fine brushes, ink, pencils, and airbrush, created the "realistic" representations of features and elements in their respective colors, texture, lighting, and visual elements. Some of these simulations are located in the Map Volume.

Visual Contrast - Visual contrast is defined as a measure of physical change in the landscape that would result from the introduction of a project. The presence of the towers and conductors, substations, series compensation stations, microwave facilities, access roads, and other ancillary facilities cause visible change in the landscape. Potential visual impacts are determined by analyzing how visual contrasts are perceived from sensitive viewpoints. Visual contrast mapping was derived through a series of GIS models that generated mapping for three contrast components:

- landform contrast
- vegetation contrast
- structure contrast

Contrast levels of strong, strong-moderate, moderate, moderate-weak, and weak were delineated on maps for each of these three components. Overall visual contrast levels of strong, moderate, and weak were derived in GIS by combining the maps of landform, vegetation, and structure contrast. Each of the contrast components are described below.

Landform contrast is the change in landforms, exposure of soils, potential for erosion scars, slumping, and other physical disturbances that would be noticed as uncharacteristic in the

natural landscape. Landform contrast was determined through a GIS model that used the degree of ground disturbance that would be expected to result from access road construction, tower assembly and erection, and other ground disturbing construction activities.

Vegetation contrast is the change in vegetation cover and patterns that would result from construction activities. Vegetation contrast was determined through a GIS model that evaluated the diversity and complexity of vegetation types and patterns in the area along alternative corridors. Diversity is a major criteria in determining the inherent capability of the landscape to absorb visual change. The model determined vegetation diversity by evaluating the number of different landcover types encountered in the vicinity of alternative corridors. Land cover types were established from data classified on recent Thematic Mapper satellite imagery.

Structure contrast examined the compatibility of the proposed transmission line facilities with other structures in the landscape and the existing natural landscape. Structure contrast is typically strongest where there are no other structures (e.g., buildings, existing utilities) in the landscape setting. The key element in determining structure contrast for this project was the presence or absence of existing transmission lines. Structure contrast would be considerably weaker where the SWIP would parallel other transmission lines, especially lines of similar structure types. The structure contrast levels of proposed tower types for the SWIP and existing transmission lines paralleled by the alternative corridors are illustrated in the Technical Report (refer to Appendix H for locations where technical reports can be reviewed).

Visual Impacts - The potential effects of the visual contrasts that would be associated with the SWIP are described first in terms of visual impacts to viewers and impacts to the scenic quality of the natural landscape. In addition, visual effects are described in terms of their potential to comply with agency visual management direction, VRM and VQO. Initial visual impacts were determined by analyzing the visibility contrasts caused by the SWIP from sensitive viewpoints.

Generally, strong visual contrasts in the landscape viewed from high sensitivity viewpoints within a mile would result in high initial impacts. Visual impact levels generally get lower as visual contrasts become weaker or as the distance from the viewpoint increases. These contrasts are defined as follows:

High Strong visual contrast associated with the presence of the transmission line and vegetation removal and/or exposure of contrasting soil/rock color from ground disturbing activities that are visible from high sensitivity viewpoints (e.g., residences, recreation sites, scenic routes, etc.) within the 0-1/4 mile and 1/4 - 1 mile distance zones. Also, the result of moderate visual contrasts visible from high sensitivity viewpoints within the 0-1/4 mile distance zone.

Moderate Weak visual contrasts visible from high sensitivity viewpoints within the 1/4 - 1 mile distance zones and strong or moderate visual contrast visible in the 1 - 3 mile distance zone.

Low Weak visual contrast visible from high sensitivity viewpoints within the 1 - 3 miles distance zone, and strong, moderate, or weak contrast visible within the 3 miles and beyond distance zone.

In some cases, extensive areas of moderate impacts were considered to be significant. For example, a route adjacent to an existing transmission line that parallels a moderate sensitivity road (e.g., U.S. Highway) for several miles. This case would result in moderate impacts to views of travelers for several miles. Because of the extended duration of the view, these moderate impacts would be considered significant.

Mitigation - Potential initial visual impacts can be effectively reduced through mitigation measures that reduce the visibility of the project from sensitive viewpoints and/or the visual contrasts associated with the line (e.g., towers and conductors, access roads). Selectively committed mitigation measures (refer to Table 4-2) would be applied on a site specific basis when visual contrasts could be expected to be effectively reduced. In many cases high initial impacts that would be considered significant could be reduced to moderate impacts that would not be considered significant. Although in certain cases, the residual impact level (after mitigation) may be the same as initial impact level. Where this occurs, the mitigation is still considered effective in reducing visual contrasts, even though the residual impact may still be considered significant. A set of generic mitigation measures (refer to Table 4-1) would be applied to all impacted areas.

The use of nonspecular (nonreflective) conductors and dulled structures in sensitive viewsheds could substantially reduce visual contrasts. This mitigation measure involves treating structural and conductor surfaces to minimize the reflection of sunlight from the transmission line under specific lighting conditions. Other mitigation measures involve using modified or alternative tower types, positioning towers to match the span of existing lines being paralleled (where feasible), or placing towers at the maximum distance away from a road or trail crossings. The locations of specific mitigation recommendations along each alternative study are listed in the technical reports (refer to Appendix H for the locations where technical reports can be reviewed).

Results

Residual visual impacts in areas of VRM Class III and Class IV are expected to meet the guidelines of these management classes following the application of generic and selectively recommended mitigation measures to reduce visual contrasts.

BLM has expressed concerns for potential visual impacts to dispersed recreation viewpoints within WSAs and designated Wilderness areas. Because of the dispersed nature of recreation use within these areas, no specific viewpoints could be identified and no specific impacts or recommended specific mitigation could be made for these areas. However, IPCo has committed to recommended mitigation based on the distance from alternative route segments to the boundaries of these areas. Specifically, nonspecular conductors would be used where a route would pass within 1 to 3 miles of a WSA or wilderness area boundary, and a

combination of nonspecular conductors and dulled towers would be used where a route would pass within 1 mile (refer to Table 3-3). These mitigation measures would reduce the visual contrasts from dispersed viewpoints within the boundaries of WSAs or wilderness areas and are expected to result in residual visual impacts from low to moderate.

The results of the visual impact assessment for each of the alternative routes are described, from north to south, in the following sections. For detailed descriptions of the potential impacts, refer to the technical reports (locations where technical reports can be reviewed are listed in Appendix H).

Alternative Routes - Midpoint to Dry Lake

Route A

From Midpoint Substation to Jackpot, Nevada, Route A would result in high residual visual impacts to views from residences located within 1/2 mile of the assumed centerline. These impacts would occur for 1.5 miles adjacent to the communities of Hansen and Eden in Idaho (Links 20, 41), 0.9 miles near rural residences north of Hansen (Link 10), 4.7 miles occur in the Rock Creek Area (Link 41), and 0.5 miles near Jackpot (Link 70).

Other high residual visual impacts are expected to occur for 0.4 miles where the route would cross the access road to the Minidoka Relocation Center (Link 20) and for another 0.4 miles (Link 20) from the Minidoka Relocation Center historic interpretive site. The route would not comply with VRM Class II for about 0.8 miles where the route would cross the Snake River Canyon southwest of Murtaugh.

A total of approximately 1.7 miles of high residual impacts are expected to occur where the route would cross access roads to recreation sites in the Salmon Falls Reservoir SRMA northwest of Jackpot. Route A would not comply with VRM Class I where the route passes through the Salmon Falls Creek Reservoir SRMA east of Browns Bench (Link 70).

Between Jackpot and the North Steptoe substation site, the route would result in 0.2 miles of high residual visual impacts to views from residences located near Contact, Nevada (Links 101, 102, 110). In the Contact area, the route would not comply with VRM Class II for about 3.0 miles, where the route would pass through the Granite Mountains (Link 102). The route would also not comply with VRM Class II for 1.0 miles where the route would cross Bishops Creek and pass along the northern toe of the Windermere Hills (Link 1612). In addition, the route would not comply with VRM Class II for about 2.0 miles where the route would be within the low visibility corridor designated along Interstate 80 by BLM.

From the North Steptoe substation site to the Dry Lake substation site, Route A would result in about 0.1 miles of high residual impacts to views from an isolated residence in the Steptoe Valley (Link 270) near Cherry Creek Station. In Jakes Valley, the route would result in about 0.5 miles high residual impacts to views from access roads (Link 669) that access recreation destinations in the Humboldt National Forest.

Where the route would cross U.S. Highway 93, a portion of designated scenic highway (Link 675), at the southern end of Dry Lake Valley, high residual impacts to views from travelers would occur for about 0.6 miles. Similarly, this route would result in about another 0.6 mile of high impacts where it would cross the Kane Springs Backcountry Byway (Links 690, 700) east of its junction with U.S. Highway 93.

Route A would result in moderate residual impacts to views from U.S. Highway 93 for about 11.5 miles where the route would parallel UNTP adjacent to the highway through Pahranagat Wash. Though this highway is a moderate sensitivity viewpoint, the extended duration of view would result in significant impacts. In addition, visual contrasts within one-half mile of the portion of Route A that would parallel U.S. Highway 93 and Pahranagat Wash would also result in moderate visual impacts to dispersed views from backcountry users in the Delamar Mountain and Evergreen WSAs. The route would result in 0.5 mile of high residual impacts where it would cross U.S. Highway 93 adjacent to the highway historic marker and roadside turnout. Also refer to the cross sections in the Map Volume.

Visual contrasts along Route A would not comply with the VRM Class II designation in the area east of the Pahranagat National Wildlife Refuge (Link 690) for approximately 1.5 miles. In addition, visual contrasts would not comply with the VRM Class II designation in the area of the low pass between Coyote Spring Valley and Hidden Valley (Link 720) for about 1.3 miles.

Route B

From the Midpoint Substation to Jackpot, Nevada, the descriptions for visual impacts to residences, scenic highways, parks and recreation viewpoints, and compliance with VRM designations for Route B would be the same as those described for Route A, above.

From Jackpot to the North Steptoe substation site, the route would result in 0.5 miles of high residual impacts to views from the crossing of the California Trail Scenic Backcountry Byway (Link 91). In Trout Creek the route would result in about 0.4 miles of high residual impacts to views from a rural residence. The route would not comply with VRM Class II for about 1.0 mile where it would cross Salmon Falls Creek toward Trout Creek (Link 91). Further south in the Thousand Springs Valley, the route would cause about 0.7 miles of high residual impacts at a crossing of the California Trail Scenic Backcountry Byway (Link 140). The route would not comply with VRM Class II through Toano Draw into Goshute Valley for about 13.0 miles where the route would be within the low visibility corridor BLM has designated along Interstate 80 (Link 222) and for another 4.0 miles along the toe of the Goshute Mountains (Link 226).

From the North Steptoe substation site to the Dry Lake substation site, the descriptions of visual impacts for Route B would be the same as those described above for Route A.

Route C

From Midpoint Substation to Toano Draw north of Interstate 80, the high residual impacts to views from residences, scenic highways, parks and recreation and compliance with VRM designation for Route C would be the same as those described for Route A.

From the vicinity of Interstate 80 to the Dry Lake substation site, the high residual impacts to views from residences, scenic highways, parks and recreation viewpoints, and compliance with VRM designation for Route C would be the same as those described for Route B.

Route D

From the Midpoint Substation to Jackpot, Nevada, the high residual impacts to views from residences, scenic highways, parks and recreation viewpoints, and compliance with VRM designations for Route D would be the same as those described for Route A, above.

North of Wells, the route would not comply with VRM Class II for about 5.5 miles where it would pass along the west side of Bishop Creek. East of Wells, the route would cross about 5.0 miles of the BLM's Interstate 80 low visibility corridor (Link 180) and would not comply with its VRM Class II designation.

In the Independence Valley, the route would result in about 0.4 miles of high residual impacts to views from a ranch residence (Link 180).

From North Steptoe substation site to the Dry Lake substation site, high residual impacts to views from residences, scenic highways, and parks and recreation viewpoints and compliance with VRM designations for Route D would be the same as those described for Route A.

Route E

From the Midpoint Substation to the crossing of Interstate 80, the high residual impacts to views from residences, scenic highways, parks and recreation viewpoints and compliance with VRM designations for Route E would be the same as those described for Route B.

From the crossing of Interstate 80 to the Dry Lake substation site, the high residual impacts to views from residences, scenic highways, and parks and recreation viewpoints and compliance with VRM designations for Route E would be the same as those described for Route B.

Route F

From Midpoint Substation and Jackpot, the route would result in a total of about 5.3 miles of high residual impacts to views from rural residences near the community of Hagerman and

on the bluff above (Links 61, 62). Where the route would cross the Hagerman Valley and the Snake River, it would result in about 0.6 miles of high residual impacts to views from U.S. Highway 30, the Thousand Springs Scenic Route (Link 61).

Route F would result in about 0.3 miles of high residual impacts where the route crosses a proposed access road into the Hagerman Fossil Beds National Monument (Link 62). For about 1.0 mile where this route would cross the Snake River (Link 61) and about 2.0 miles adjacent to the Fossil Beds National Monument (Link 64), this route would not comply with VRM Class I designations.

The route would result in a total of 5.8 miles of high residual impacts to views from roads that provide access to the Salmon Falls Creek WSA (Link 64) and the Salmon Falls Reservoir SRMA from U.S. Highway 93. This route would not comply with VRM Class II for about 3.0 miles where it would parallel the Salmon Falls Creek Canyon.

In the vicinity of Castleford, Idaho along the eastern rim of the Salmon Falls Creek Canyon (Link 64), this route would result in about 3.5 miles of high residual impacts to views from rural residences. Also, the route would not comply with VRM Class II for about 0.7 miles where it would cross Salmon Falls Creek within the Salmon Falls Creek SRMA west of Jackpot (Link 711).

In Thousand Springs Valley, Route F would result in about 0.7 miles of high residual impacts to views where it would cross the California Trail Scenic Back Country Byway (Link 140). Further south, the route would not comply with VRM Class II for 5.0 miles where it would cross the BLM's Interstate 80 designated low visibility corridor (Link 211).

From the North Steptoe substation site to the Dry Lake substation site, the high residual impacts to views from residences, scenic highways, and parks and recreation viewpoints and compliance with VRM designations from Route F would be the same as those described for Route A.

Route G

From the Midpoint Substation to Jackpot, high residual impacts to views from residences, scenic highways, parks and recreation viewpoints, and compliance with VRM designations for Route G would be the same as those described for Route A.

From Jackpot to the North Steptoe substation site, Route G would result in about 0.5 miles of high residual impacts to views from residences in the Contact area (Links 713, 715). This route would not comply with VRM Class II for about 1.0 mile where it would cross Salmon Falls Creek within the Salmon Falls Creek SRMA west of Jackpot (Link 711).

In Thousand Springs Valley, the route would result in about 0.5 miles of high residual impacts to views from several residences at the Winecup Ranch (Link 151). The route would also result in about 0.7 miles of high residual impacts to views from the California Trail Scenic Back Country Byway. The route would cross the BLM's designated low visibility

corridor of Interstate 80 further south (Link 211), and would not comply with VRM Class II for about 5.0 miles.

From the North Steptoe substation site alternative to the Dry Lake substation site alternative, the significant visual impacts to residences, scenic highways, parks and recreation viewpoints, and compliance with VRM guidelines that would result from Route G would be the same as those described for Route B.

Alternative Routes - Ely to Delta

Direct Route

East of the North Steptoe substation site this route would result in about 0.2 miles of moderate to high residual impacts to views from a ranch residence located on the western toe of the Schell Creek Range (Link 262). It would result in about 0.4 miles of high residual impacts to views from the Pony Express Trail, at the north end of Spring Valley.

The remainder of the route would pass through remote and undisturbed landscapes with low impacts to scenic quality and to views from parks and recreation and travel routes viewpoints. The impacts created by construction of the proposed transmission line would result in adverse visual impacts on scenic values and would reduce the scenic quality in these remote areas. However, these impacts would comply with the VRM Class IV designations crossed by the route.

Cutoff Route

East of the North Steptoe substation site, this route would result in about 0.2 miles of moderate to high residual impacts to views from a ranch residence on the western toe of the Schell Creek Range (Link 262). It would also result in about 0.4 miles of high residual impacts to views from the Pony Express Trail at the north end of Spring Valley. In addition, this route would pass within three miles of the Mount Moriah Wilderness. However, no high residual impacts are expected to occur to dispersed viewers in this wilderness area.

This route would result in 0.6 miles of high residual impacts to views from a road that provides recreation access to the Howell Peak WSA (Link 470). Further east, the route would pass adjacent to an isolated residence near the Red Knolls in Whirlwind Valley (Link 470) resulting in about 0.25 mile of moderate residual impacts.

230kV Corridor Route

Originating from the Robinson Summit substation site, this route would result in about 1.2 miles of high residual impacts to views from rural residences in Smith Valley and in Steptoe Valley north of Ely (Link 351).

About 0.5 miles of high residual impacts would occur to views from the entrance road into Cave Lake State Park, which is also part of the Success Loop scenic route (Link 380). It would result in about 1.2 miles of high residual impacts to views from an area proposed for development as a primitive camping site in Weaver Creek (Link 460) east of Sacramento Pass. Further east, the route would pass between two isolated farms on Silver Creek and would result in about 0.9 miles of high residual impacts to views from residences.

Because of the level of concern expressed during project scoping and the national significance of Great Basin National Park (GBNP), the SWIP visual analysis assessed the potential impacts to views from several existing and planned overlooks and facilities sites within the park. Further, the assessment included four proposed interpretive road wayside sites. The locations of the wayside sites identified in the Draft General Management Plan for the GBNP are preliminary. The proposed transmission line would be visible for many miles across Snake Valley (Links 461, 462) from several of the viewpoints within GBNP due to unique visibility conditions that allow clear views for up to 20 miles or more across this valley. However, because of the great distance between the proposed transmission line and these viewpoints and the presence of two existing 230kV transmission lines, visual impacts are expected to be low under most viewing circumstances. Somewhat stronger visual contrasts could be expected under specific lighting conditions (e.g., sunrise or sunset). The use of nonspecular conductors for the portion of the SWIP that would cross Spring Valley would effectively minimize this effect.

Although U.S. Highway 6/50 was inventoried as a moderate sensitivity viewpoint, it provides primary access to GBNP. Approximately 0.5 mile of moderate to high residual impacts to views from travellers on U.S. Highway 6/50 are expected to occur where the route would cross the highway in the Sacramento Pass area. H-frame towers would be used at this highway crossing to minimize structure contrasts with the existing 230kV transmission lines.

This route would result in 0.6 miles of high residual impacts to views from a road that provides recreation access to the Howell Peak WSA (Link 470). Further east, the route would pass adjacent to an isolated residence near the Red Knolls in Whirlwind Valley (Link 470) and would result in about 0.25 miles of moderate residual impacts.

Southern Route

From the Robinson Summit substation site, the route would result in 3.2 miles of high impacts to views from the proposed Horse and Cattle Camp Backcountry Byway (Link 364) where this route would cross in the Steptoe Valley. Also in this area, the route would pass within one-half mile of the Mount Grafton WSA. Near Lake Valley Summit, the route would result in about 0.5 miles of significant visual impacts to views from a portion of U.S. Highway 93 that is a designated scenic highway (Link 420). Although there would be only about 0.3 miles of high impacts to views from residences (Link 560), the route would result in moderate impacts views from residences along much of Link 560.

Socioeconomics

Introduction

This section describes potential changes in existing socioeconomic characteristics within the study area that could result from the proposed project. The primary socioeconomic effects associated with transmission line projects are: (1) construction-period impacts within area communities, (2) social and economic impacts along the selected route, and (3) fiscal effects within local jurisdictions. These effects can be adverse or beneficial, and short-term or long-term in nature. They may be experienced by property owners along the transmission line routes, residents of nearby communities, and taxpayers in jurisdictions crossed by the route.

The influx of the construction labor force can have both adverse and beneficial impacts on area communities. Potential adverse affects include overburdening existing retail facilities, such as motels and restaurants, and public services and facilities, such as law enforcement and public roads. The project can also benefit local communities by increasing retail sales or generating employment. These impacts are short-term, lasting only for the duration of construction in the area.

Social and economic impacts may result where existing or planned land uses are displaced by the right-of-way or where the transmission line affects nearby properties. The effects of the selected route on agricultural production and recreation areas are of particular concern to the public in this study. Specific land-use impacts are addressed in the Land Use section.

Revenues from property taxes assessed on the project provide a long-term benefit to local taxpayers. This can be particularly important to small rural communities with declining tax bases. Additional revenues may be generated through local sales taxes on purchases by construction contractors and workers, but these revenues are generally small and transitory. In addition to payments to private property owners for fee purchases or for right-of-way leases, the FS and BLM receive right-of-way payments on federal lands crossed by the route.

Methods

The basic methodology for assessing socioeconomic impacts is to compare the pre-project environment, or no-action alternative with the projected condition of the socioeconomic parameters of interest with the project implemented.

The assessment of construction impacts involved evaluating whether the influx of construction workers would require additional community services or facilities, including accommodations. Potential economic benefits from the influx of workers were also considered. The assessment involved an analysis of data on the proposed construction schedule, size of the work force, project hiring procedures, population distribution, available campgrounds, and other accommodations within counties crossed by the alternative routes.

Data related to project construction were obtained from contacts with IPCo and LADWP, and the SWIP Preliminary Construction, Operation, and Maintenance Plan (May 1990).

According to IPCo, construction of the transmission line would require at least one construction contractor with a minimum of 105 workers. It is possible that an additional contractor may begin work simultaneously at the opposite end of the project. Typical personnel required from each contractor are shown in Table 2-3. Fenced construction yards would be placed approximately every 20-30 miles along the selected route. Construction is expected to begin in 1995 and be completed by the summer of 1998.

Because the construction work would be contracted, it is not possible to determine the geographic origin of the work force. Estimates from one construction company anticipate that 60 percent of the work force would be unskilled labor hired locally with the remaining 40 percent being skilled labor from out of town. Generally, more unskilled, local workers would be needed for steel lattice tower construction than for other structure types. Approximately 10 percent of the local hires are likely to stay with the project throughout its duration (West 1990).

The social and economic assessment involved identifying potential beneficial or adverse impacts on social and economic activities in the area. High-use tourist areas were identified and right-of-way compensation procedures evaluated. Mitigation of impacts to agricultural lands, grazing, and mining operation are addressed in the Land Use section.

In general, the effects of transmission lines on existing social structures and economic activities are relatively small. Social and economic issues include potential effects from the influx of construction workers, disruption of land-based economic activities such as timber production or livestock grazing, and compensation for right-of-way.

Potential impacts from construction are typically minimal due to the small size and short-term work force characteristics of transmission line construction. Some conflicts may exist if the construction work force competes with tourists for space in motels, parks, trailers, and campgrounds. Increased traffic associated with transporting both workers and equipment to and from the worksite could also result in potential conflicts with tourist activities. Such conflicts may be minimized by scheduling construction to avoid tourist areas during holidays, establishing worker camps away from high-use campgrounds, or busing workers from large communities.

Fiscal impacts are assessed by estimating potential property tax revenues from the project by county. Estimates for assessed value for the project are derived by multiplying the distance of transmission line for each alternative route by the assessment ratio for each state and by the average cost per mile for the project. To calculate the project's average cost per mile, the value of substations and series compensation facilities are added to the transmission line costs and the total is divided by the length of the project. Property tax revenues by county are estimated by multiplying the assessed value by the average property tax rate in each county. The estimates represent annual property tax revenues for the first year of operation without depreciation.

Results

Alternative Route - Midpoint to Dry Lake

Route A

The demand for temporary accommodations along the routes would depend upon the workers' home base. Because the area is sparsely populated, workers would probably haul camper trailers to each jobsite and stay in nearby campgrounds, trailer parks, or other spaces with electrical hook-ups. Approximately 50 percent of the work force (estimated 52 workers) would require temporary accommodations near the jobsite. Along Route A, workers from outside the area may also relocate their families to the larger communities in the vicinity such as Twin Falls, Jerome, Elko, Wells, Ely, Delta, and Las Vegas.

Given the relatively small size of the construction work force, adequate facilities should exist to provide temporary accommodations. In more sparsely populated areas where few established campgrounds are available, jobsite camp areas may need to be developed or a program to bus workers from larger communities might be established. Potential conflicts could exist in the vicinity of Elko, Nevada, where there is a housing shortage resulting from increased mining activity. However, this alternative is approximately 30 miles from Elko, so it is unlikely that the majority of the workers would locate there.

Local communities would benefit from purchases by construction workers. However, since the construction work force is both small and mobile, the impact of these expenditures is expected to be minimal.

Displacement of agriculture, grazing, and other land uses is addressed in the Land Use section. Social and economic concerns would include potential disruptions to residences, agricultural properties, gravel pits or quarries, and a school. These impacts can be minimized or eliminated through tower placement, routing modifications, and other mitigation.

In general, new land rights would be required for the transmission line and transmission line access roads. Non-federal lands necessary for the transmission line right-or-way would be obtained as perpetual easements. Additional lands for substations, as necessary, would be purchased in fee simple. The land rights would be obtained in the name of IPCo. Every effort would be made to purchase all the land rights on private lands through reasonable negotiations with the present owners. A grant for a 200-foot right-of-way has been requested for the portions of the transmission line that would cross federal lands administered by the BLM, FS, and the Bureau of Reclamation.

Property taxes paid by IPCo would benefit tax jurisdictions within the counties crossed by the transmission lines and associated facilities. Although these taxes are centrally assessed by each state, county jurisdictions would receive payments according to the length of the project in each county. Table 4-4 presents estimates of property tax revenues by alternative route.

Jerome, Twin Falls, and Cassia counties in Idaho would receive tax benefits from this route. Jerome County's tax revenues would be an estimated $455,700. Based on this estimate, Route A would represent approximately 5.3 percent of the county's assessed valuation in 1990 values. Revenues to Twin Falls County would be approximately $570,700 and to Cassia County would be approximately $20,800. The project would represent approximately 2.1 percent of 1990 assess valuation in Twin Falls County and 0.25 percent of 1990 assessed valuation in Cassia County.

In Nevada, Elko and White Pine and Lincoln counties would each receive over $500,000 in revenues from this alternative. Because of the relatively low tax bases in Lincoln and White Pine counties, the assessed value of the project would represent approximately 19 percent of White Pine County's assessed valuation in 1990 and approximately 45 percent of Lincoln County's 1990 assessed valuation. Nye and Clark counties would also receive tax payments between $150,000 and $261,000 from this alternative.

Route B

Since Route B is the same as Route A in Idaho, the assessment for Route A would also apply to Route B.

In Nevada, Route B would cross through the same counties as Route A, and socioeconomic impacts would be comparable. If Route B were constructed, workers might choose to stay in Wendover, since this route is near the Utah border. With respect to social and economic impacts, Route B would bypass ranching operations in the Steptoe Valley. Fiscal impacts would be the same for Lincoln, Nye, and Clark counties, slightly higher for White Pine County and Elko counties.

Route C

Since Route C is the same as Route A in Idaho, the assessment for Route A would also apply to Route C. In Nevada, construction, social, and economic impacts from this route are expected to be comparable to Route A. In terms of fiscal impacts, potential revenues would be the same for White Pine, Lincoln, Nye, and Clark counties. Route C would produce approximately $127,100 in potential revenues for Elko County compared with $759,200 from Route A.

Route D

Since Route D is the same as Route A in Idaho, the assessment for Route A would also apply to Route D. In Nevada, Route D extends to the west nearest Wells and closest to the Humboldt National Forest in this area. Route D represents the highest potential estimated tax revenues for Elko County, $767,600.

Route E

Since Route E is the same as alternative A in Idaho, the assessment for Route A would also apply to Route E. In Nevada, Route E would be a combination of Route A in the northern portion of the route and Route B in the southern portion of the route. This alternative would produce the highest revenues for White Pine County, $596,100.

Route F

Route F would head west out of Midpoint Substation through the Hagerman area near the Hagerman Fossil Beds National Monument. This route would result in potential conflicts with tourist activities during construction, depending upon when construction is conducted in this area. Jerome, Twin Falls, and Gooding counties in Idaho would receive potential tax benefits from this alternative. Jerome County would receive approximately $144,100 in revenues from this route. Twin Falls County would receive approximately $916,000 in potential revenues, nearly $350,000 more than would result from the other alternative routes. This is the only alternative route that would cross Gooding County which would receive approximately $211,500 in potential revenues. In Nevada, Route F would be the same as Route C.

Route G

Since Route G is the same as Route A in Idaho, the assessment for Route A would also apply to Route G. In Nevada, construction, social, and economic impacts from this route are expected to be comparable to Route A. In terms of fiscal impacts, revenues would be the same for Lincoln, Nye, and Clark counties. Route G would produce slightly less potential revenues for White Pine and Elko counties than Route A. Route G represents the least amount of estimated revenues for White Pine County, $568,400.

Alternative Routes Ely to Delta

Direct Route

The Direct Route would cross through the northeast portion of White Pine County and would be the shortest crosstie route in Nevada. Potential revenues to White Pine County would be approximately $255,700. In Utah, the Direct Route would pass through Juab County, generating approximately $296,100 in potential revenues for that county. Although this route is the shortest in length, construction costs per mile are expected be somewhat more than the other crosstie routes because of the requirement for shorter and more numerous towers where this route would cross military airspace. The Direct Route would produce approximately $355,200 in potential revenues for Millard County, far less than other crosstie routes. The estimated assessed value of the Direct Route would represent 0.9 percent

of the 1990 assessed valuation of Millard County, 9.8 percent of Juab County's 1990 assessed valuation, and 8.5 percent of the 1990 assessed valuation for White Pine County.

Cutoff Route

Since the Cutoff Route would be the same as the Direct Route for most of the portion in White Pine County, the description of impacts for the Direct Route above would also apply to this route. In Utah, the Cutoff Route would cross through open country in Spring Valley then would meet and parallel the 230kV Corridor Route. This alternative would produce approximately $289,200 in potential revenues for White Pine County and $846,000 for Millard County.

230kV Corridor Route

The 230kV Corridor Route would pass through White Pine County parallel to two 230kV transmission lines into Utah. No potential conflicts with tourist activities are expected where this route pass would just north of Great Basin National Park. Demands for temporary accommodations and traffic associated with construction are not expected to conflict with tourism. Because accommodations are limited in Baker, it is expected that crews would stay in Ely. Potential revenues to Millard County would be approximately $853,700 and to White Pine County approximately $320,500.

Southern Route

The Southern Route pass would through White Pine and Millard counties to the south of the other crosstie alternatives. This route would pass around to the south of Great Basin National Park and would not conflict with tourist activity. Near Delta, this route would parallel U.S. Highway 6/50, however construction is not expected to create traffic problems. Because of its longer length, the Southern Route would produce the most revenues for Millard and White Pine counties. Estimated revenues would be almost $1 million in Millard County and approximately $.5 million in White Pine County. The project's assessed value would be approximately 2.4 percent of the 1990 total assessed valuation of Millard County and 16.5 percent of White Pine County's 1990 assessed valuation.

Electric and Magnetic Field Effects

Introduction

Questions about potential health effects from electric and magnetic field (EMF) exposures have centered around three areas: (1) cancer, (2) reproductive outcome, and (3) general physiologic and psychologic health. In a draft document on EMF health effects prepared by

the Environmental Protection Agency (EPA), and currently under scientific review, the agency has restricted its analysis to cancer. Accordingly, the section on health effects that follows places a major emphasis on the research relevant to the potential for electric and magnetic-field associated carcinogenic risk.

In 1991 the University of Southern California (USC) released EMF research on childhood leukemia and EMF exposure. Additionally, there were three scientific meetings with strong emphasis on EMF exposure and effects on animals and humans (the Society for Epidemiologic Research, Bioelectromagnetics Society, and the U.S. Department of Energy Contractor's Review). In 1991 a total of $25 million was spent on nearly 200 ongoing EMF studies in 25 countries. The recent published research tend to support that there is no conclusive evidence to date to link EMF exposure and cancer. It remains difficult to identify the exposure variables to adequately assess health risks.

Several trends emerged from the recent studies. The focus of studies continues to move from studies on human exposure to transmission and distribution lines and household appliances. *In vivo* and *in vitro* studies are taking a more prominent role where human epidemiology has traditionally responded to public concerns. Specific mechanistic research topics (e.g., melatonin production, multiphasic, non-linear, restricted-range-optimal response, and AC/DC resonance phenomena) are gaining acceptance.

Ongoing Research

Some of the current research now in progress include:

- EPRI occupational study of utility workers (Fall 1993)
- National Cancer Institute childhood leukemia study
- National Toxicology Program chronic exposure rodent study
- Canadian chronic exposure rat brain cancer study
- California Department of Health Services - Office of Environmental Epidemiology in conjunction with the Kaiser Permanente Department of Research in Oakland, Calif. (October 1992)
- Dr. Susan Preston-Martin - University of Southern California (1994)
- Data analysis of the "back-to-Denver" study, by Enertech Consultants Campbell, Calif. (now completed)

Methods

Transmission Line Electric Fields

The electric field created by a high voltage transmission line extends from the energized conductors to other conducting objects such as the ground, towers, vegetation, buildings, vehicles, and people. The strength of the vertical component of the electric field at a height of 1 meter (3.28 ft) is frequently used to describe the electric field under transmission lines.

The most important parameters of a transmission line that determine the electric field at 1-meter height are conductor height above ground and line voltage.

For evaluation of electric and magnetic fields from transmission lines it is necessary to calculate the fields for a specific line condition. The National Electrical Safety Code states the condition for evaluating electric-field-induced short-circuit current for lines with voltage above 98kV line to ground as follows: conductors are at a final unloaded (e.g., no wind or ice) sag, at a temperature of 120°F (49°C), and at a maximum voltage [NESC (National Electrical Safety Code), 1990]. For the calculation of electric and magnetic fields from the proposed transmission lines the maximum operating voltage, the maximum continuous current, and the minimum conductor clearances at a conductor temperature of 120°F (49°C) were supplied by Idaho Power Company (refer to Table 2-1). Thus these calculations represent conditions that meet the NESC criteria.

The electric fields at the edge of the right-of-way are not as sensitive to conductor height as is the peak field. Computed values at the edge of the right-of-way for any line height are fairly representative of what can be expected all along the transmission line corridor.

Transmission Line Magnetic Fields

The magnetic field generated by currents on transmission line conductors extends from the conductors through the air and into the ground. The magnitude of the field at a height of 1 meter (3.28 ft) is frequently used to describe the magnetic field under transmission lines. Because the magnetic field is not affected by nonferrous materials, the field is not influenced by normal objects on the ground under the line. The direction of the maximum field varies with location. This is in contrast to the electric field which is essentially vertical near the ground. The most important parameters of a transmission line that determine the magnetic field at 1 m height are conductor height above ground and the currents in the conductors.

Calculations of magnetic fields from transmission lines are performed using well known physical principles (Deno and Zaffanella, 1982). The calculated values usually represent the ideal straight parallel conductor configuration. For simplicity a flat earth is usually assumed. Balanced currents, i.e. currents of the same magnitude for each phase, are also assumed. This is usually valid for transmission lines where balanced loads on all three phases are maintained during operation. Induced image currents in the earth are usually ignored for calculations of magnetic field under or near the right-of-way. The resulting error is negligible. Only at distances greater than 300 feet from a line do such contributions become significant (Deno and Zaffanella, 1982). Unless the direction of power flow is known, the currents for equivalent phases on different lines have been assumed to be in the same direction.

The clearance for magnetic field calculations is taken as the same as for electric fields that is specified in the NESC: namely, the clearance at a conductor temperature of 120° F (49° C), and the conductors are at final unloaded sag.

Standard techniques for measuring magnetic fields near transmission lines are described in ANSI IEEE Standard No. 644-1987 [1987]. Measured magnetic fields agree well with

calculated values provided the currents and line heights that go into the calculation correspond to the actual values for the line. To realize such agreement, it is necessary to get accurate current readings during field measurements because currents on transmission lines can vary considerably over short periods of time.

As with electric fields, the maximum or peak magnetic fields occur in areas near the centerline and at midspan where the conductors are the lowest. If more than one line is present, the peak field would depend on the relative electrical phasing of the conductors. The magnetic field at the edge of the right-of-way is not very dependent on line height. The various cases where fields were calculated are illustrated in Figure 4-1.

In general, the scientific process used to evaluate the potential effects of environmental exposures, be they chemicals, or electric and magnetic fields relies upon the data from research studies. The research encompasses two complementary approaches, namely epidemiologic investigations and laboratory studies, each with its own strengths and limitations.

The objective of environmental epidemiology is to measure the associations between exposures to environmental factors (e.g., asbestos, benzene) and health outcomes (e.g., lung disease, leukemia). The measure of the association between exposure and outcome that is most common in the epidemiologic literature on magnetic fields, as in many other areas of epidemiology, is the relative risk. The relative risk describes the risk of disease in an exposed group relative to the risk in a reference group. Studies that report risk estimates greater than one indicate a positive association between the exposure and the disease. Studies with risk estimates less than one indicate an inverse association. Risk estimates near one indicate no association.

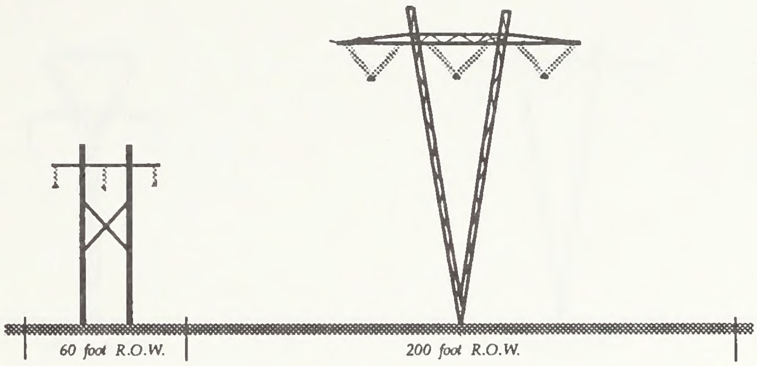
Because data collected on human populations are subject to random variations, a single value of relative risk is not a sufficient descriptor of association. Epidemiologist and statisticians have developed computational techniques that estimate the variability inherent to an epidemiologic study's data. These techniques help determine if a reported relative risk is reasonably precise and indicative of a true association, or whether the reported data are so highly variable so as to be compatible with a conclusion that no association exists.

The goal of laboratory research studies is to identify the nature of an observed effect and the dose of the agent at which it appears. A most critical distinction, therefore, must be made between natural harmless biological responses, or "effects," and those that are truly adverse or deleterious. Many chemical substances and physical agents (food, medicines, light or electric and magnetic fields) produce biological responses in organisms--like the response of the eye to light or the influence of food and water on growth and body metabolism--at quite low concentrations or intensities. Hence, the mere demonstration of a biological response or effect per se **does not** indicate that an exposure to an agent is hazardous. Rather, it is imperative to ascertain under what conditions (intensity or level of exposure, duration of exposure, etc) an agent may be toxic. In fact, toxicological studies are designed classically to identify the highest dose that does not cause an adverse effect.

CASE 1

Existing
Upper Salmon - Wells
138kV Wood H-Frame

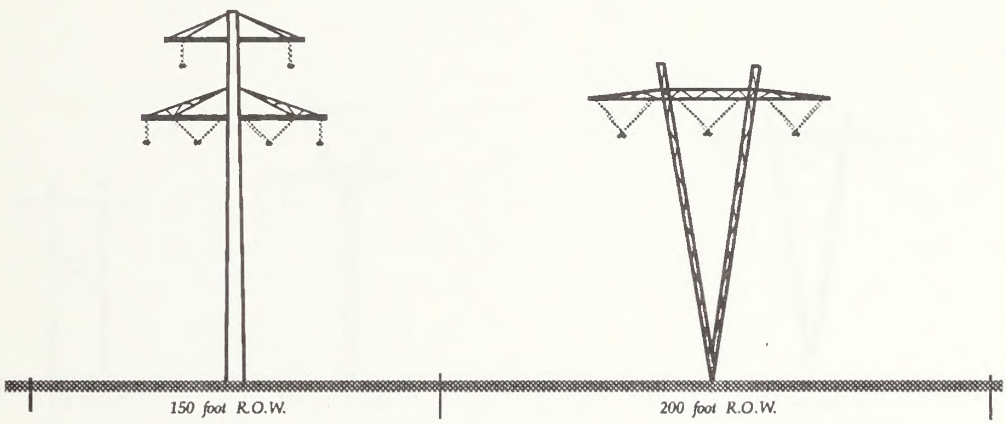
Proposed
500kV Guyed-V
steel lattice



CASE 2

Existing Midpoint - Hunt
230/345kV Double Circuit
Steel Monopole

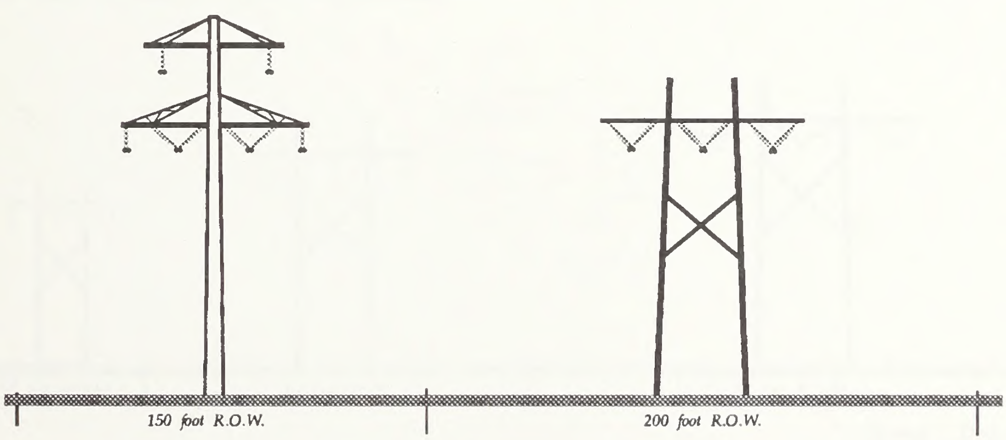
Proposed
500kV Guyed-V
lattice steel



CASE 3

Existing Midpoint - Hunt
230/345kV Double Circuit
Steel Monopole

Proposed
500kV Steel H-Frame



EMF Case Studies

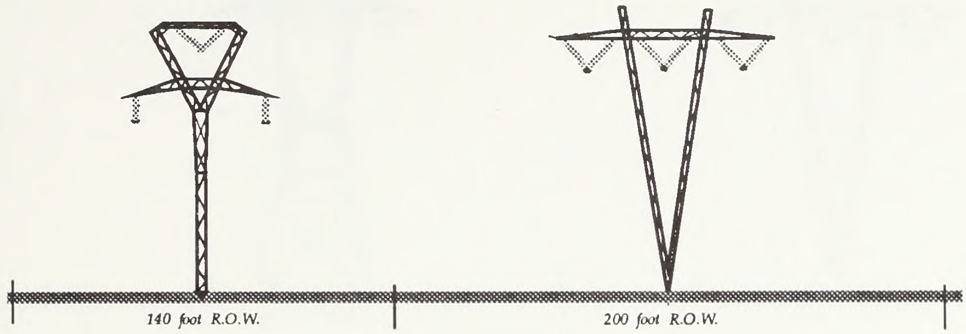
Source Dames & Moore
Note: Not to scale

Figure 4-1

CASE 4

Existing
Midpoint - Stateline
345kV Guyed Delta

Proposed
500kV Guyed-V
steel lattice

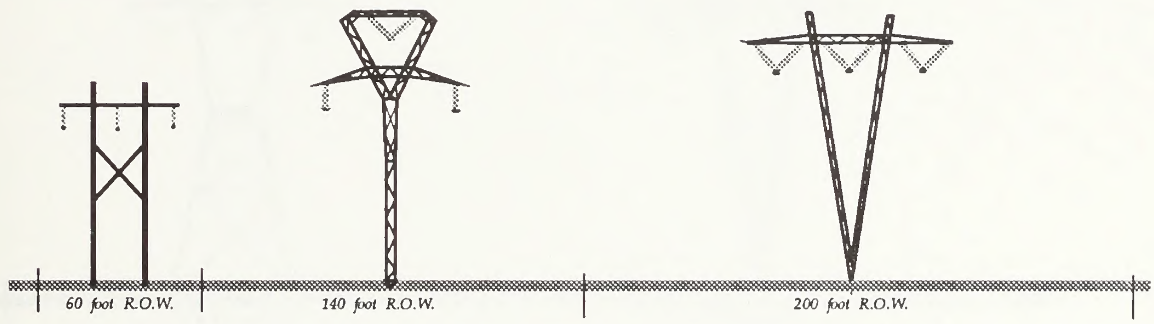


CASE 5

Existing
Upper Salmon - Wells
138kV Wood H-Frame

Existing
Midpoint - Stateline
345kV Guyed Delta

Proposed
500kV Guyed-V
steel lattice

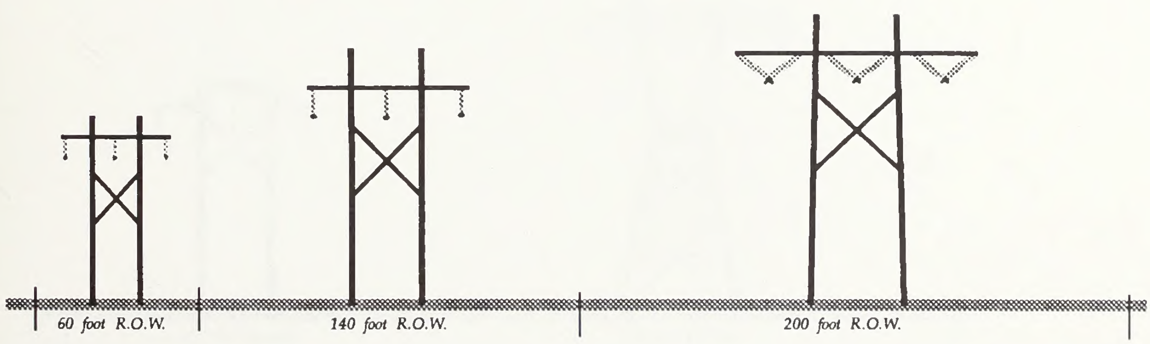


CASE 6

Existing
Upper Salmon - Wells
138kV Wood H-Frame

Existing
Midpoint - Stateline
345kV Steel H-Frame

Proposed
500kV Steel H-Frame

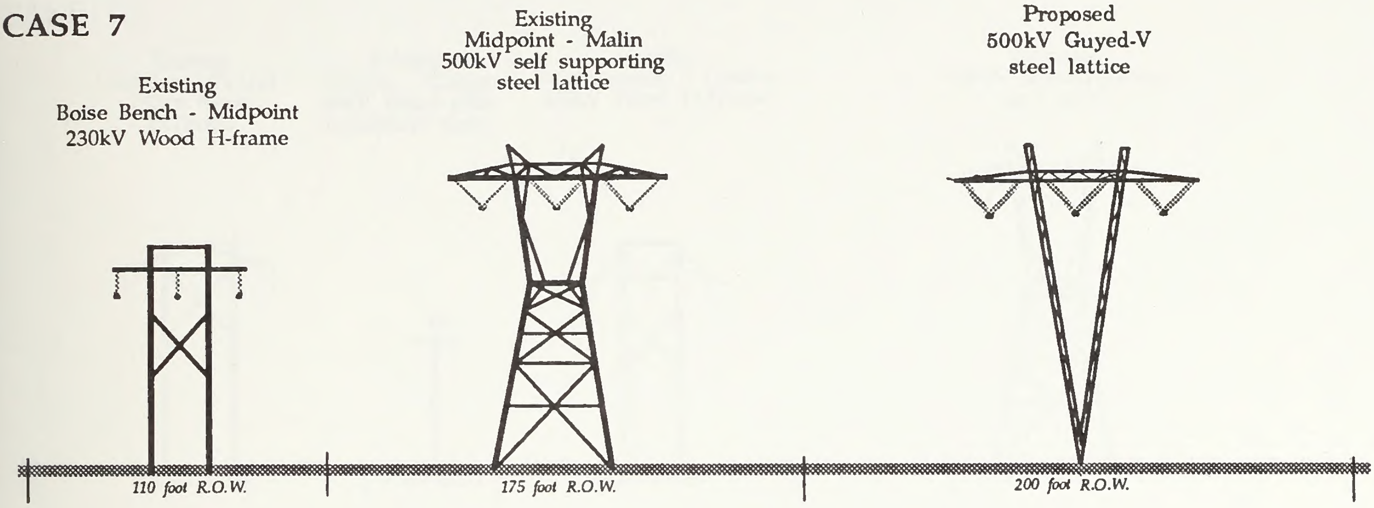


Source: Dames & Moore
Note: Not to scale

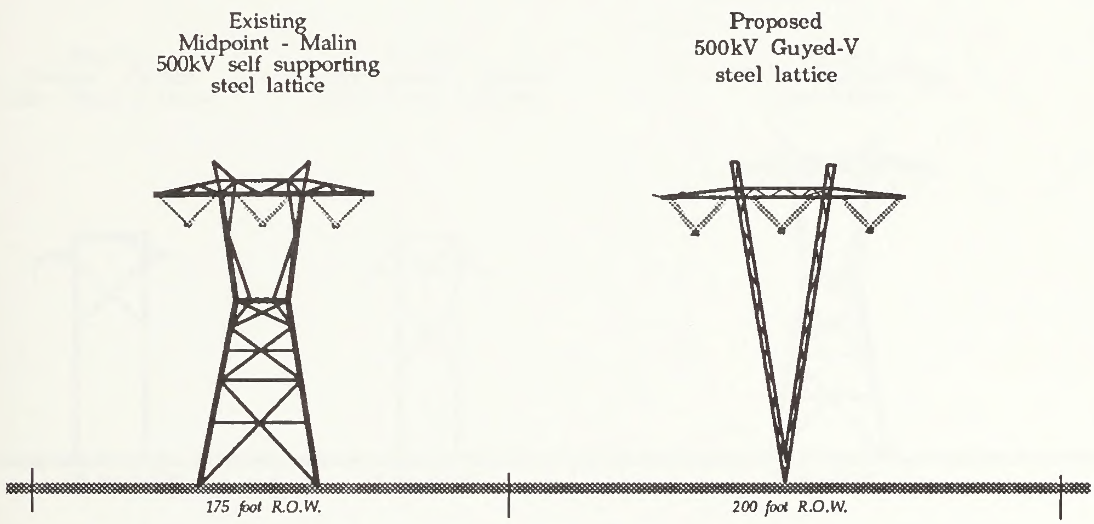
EMF Case Studies

Figure 4-1
(Continued)

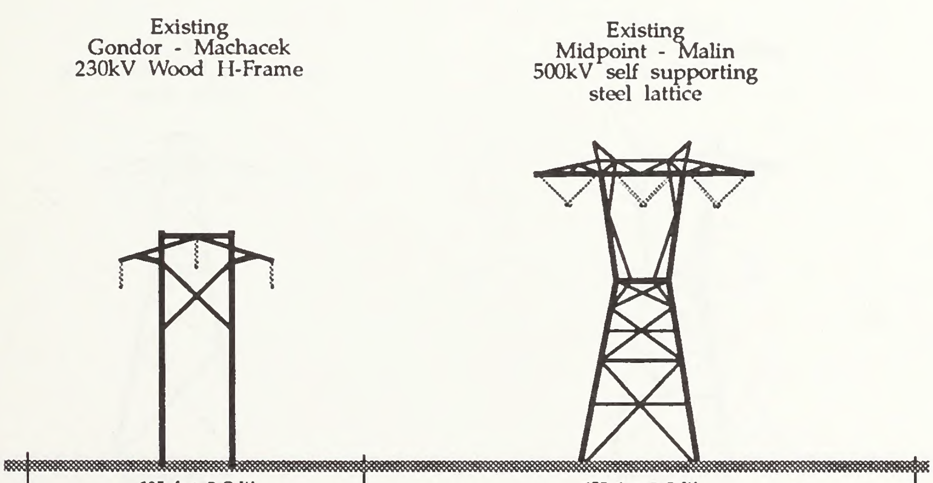
CASE 7



CASE 8



CASE 9

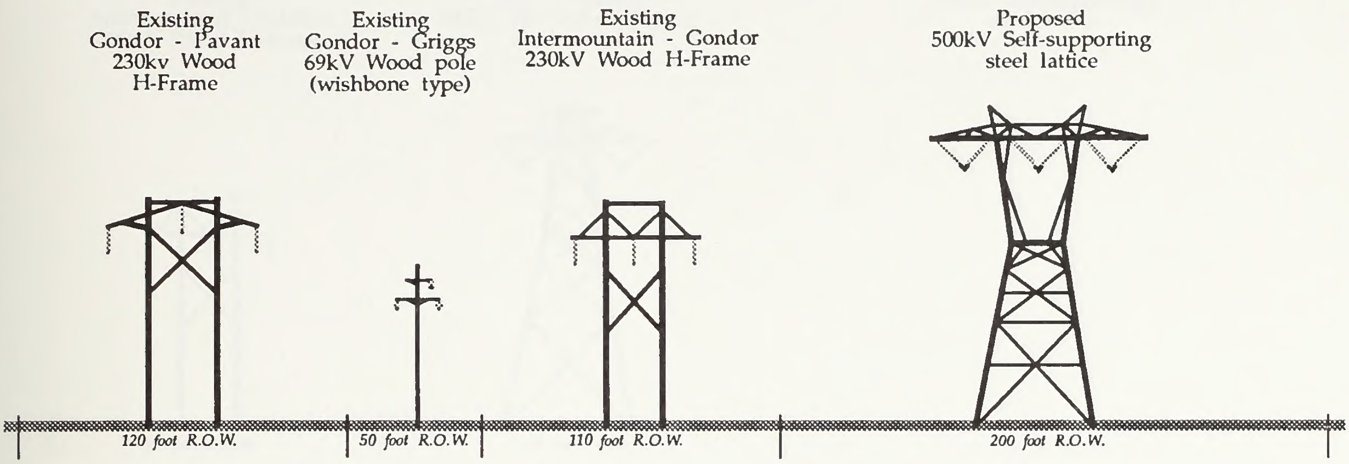


EMF Case Studies

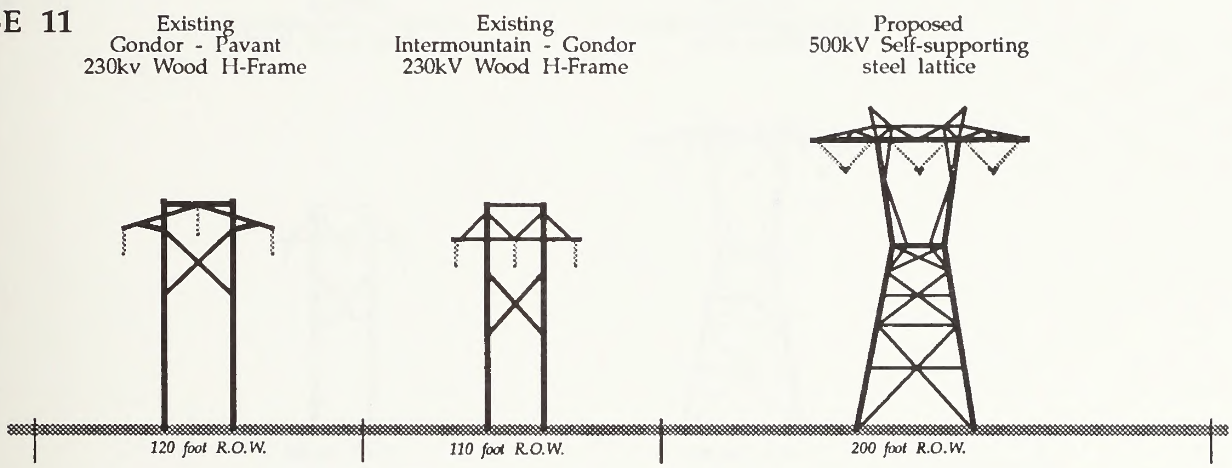
Source: Dames & Moore
Note: Not to scale

Figure 4-1
(Continued)

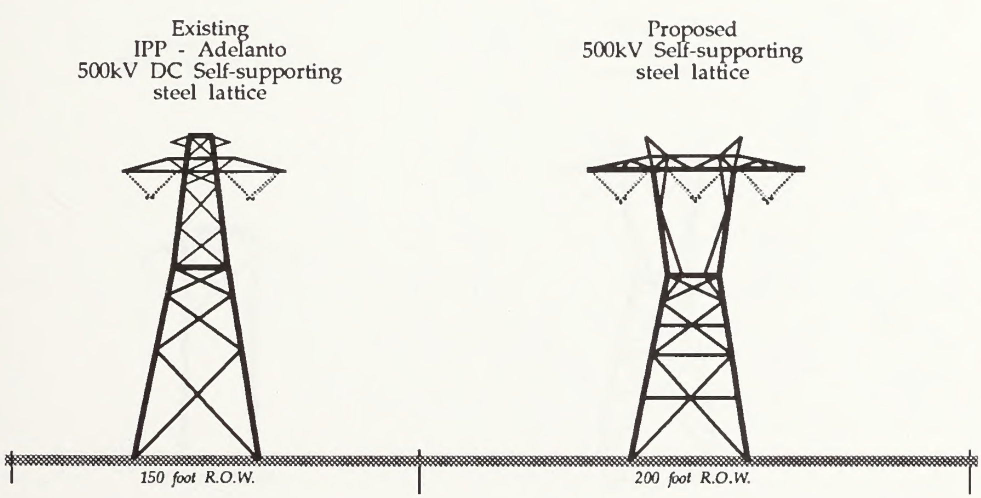
CASE 10



CASE 11



CASE 12

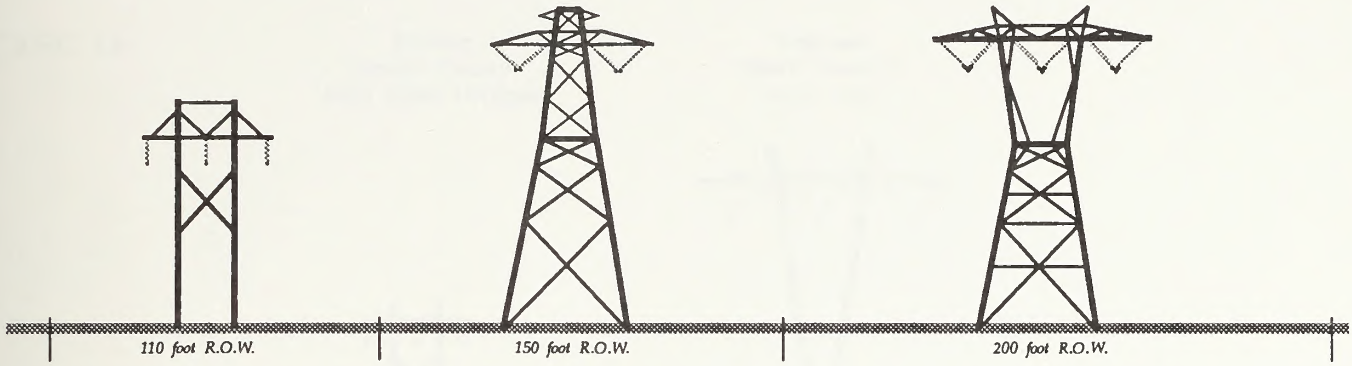


EMF Case Studies

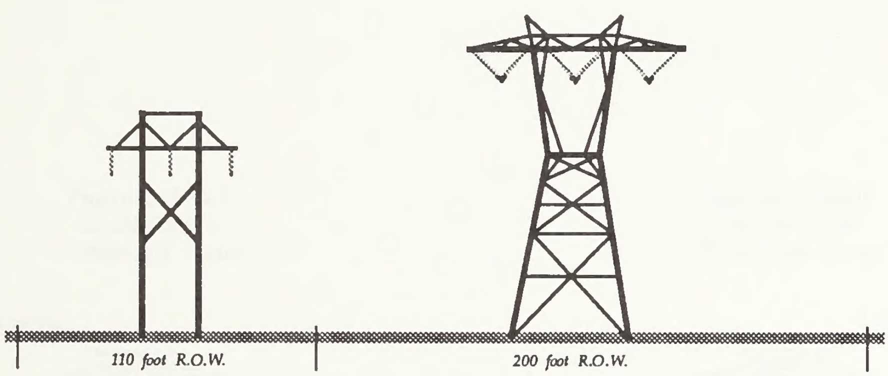
Source: Dames & Moore
Note: Not to scale

Figure 4-1
(Continued)

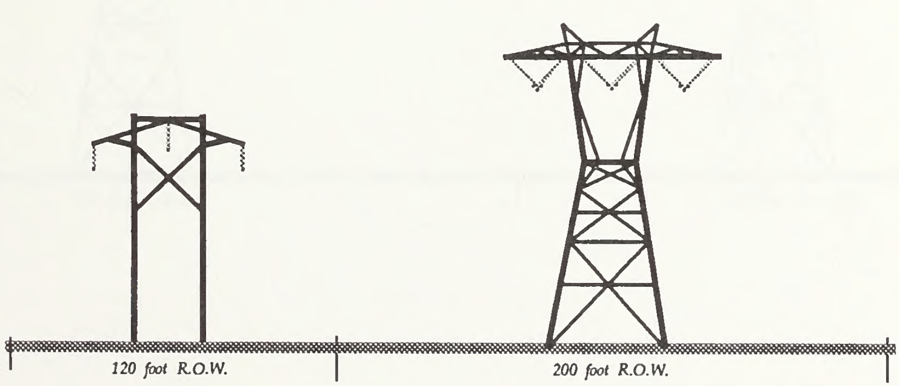
CASE 13



CASE 14



CASE 15



EMF Case Studies

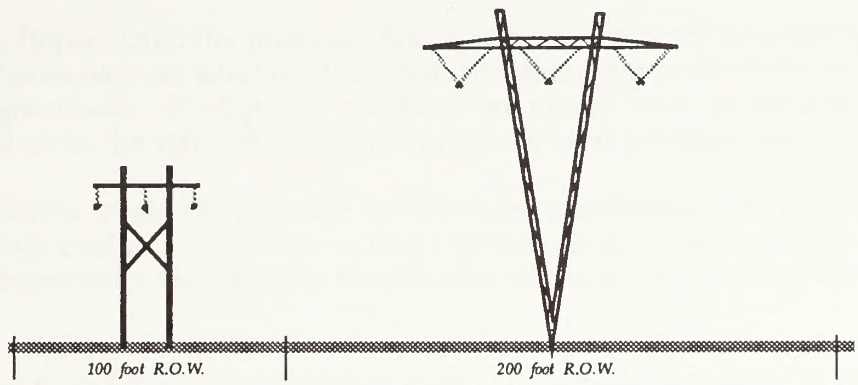
Source: Dames & Moore
Note: Not to scale

Figure 4-1
(Continued)

CASE 16

Existing
Lincoln County
69kV Wood H-Frame

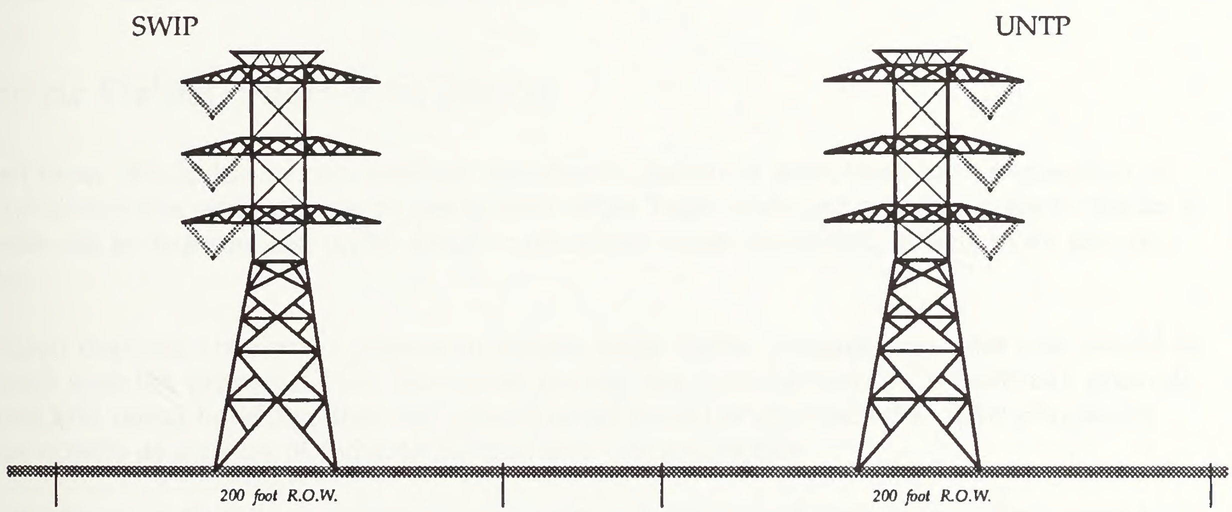
Proposed
500kV Guyed-V
lattice steel



CASE 17

Proposed 500kV
Double-circuit
(Pahranagat Wash)

Proposed 500kV
Double-circuit
(Pahranagat Wash)



Source: Dames & Moore
Note: Not to scale

Figure 4-1
(Continued)

Exposure levels in laboratory studies are usually very high relative to those that people experience. Thus an effect observed in a laboratory experiment does not necessarily translate into an effect under exposure conditions found in the real world.

Results

In most cases, the impact from the proposed line would be to extend the existing radio interference (RI) levels over an additional 200 feet corresponding to the width of the proposed new right-of-way. During foul weather there would be RI, in the form of static on AM radios, under or on the right-of-way of the proposed (and existing) lines.

Based on the predicted levels, the potential for television interference (TVI) from the proposed line is expected to be the same as that experienced from the existing lines with the area of possible interference increased by the 200-foot width of the proposed new right-of-way.

IPCo has an active program to identify, investigate, and mitigate legitimate RI and television interference (TVI) complaints. It is anticipated that TVI caused by the proposed SWIP line can be effectively mitigated.

Transmission Line Electric Fields

The calculated values of electric field at 1 meter height for the proposed SWIP 500kV single circuit transmission line are given in Table 4-5. The peak value on the right-of-way and the value at the edge of the right-of-way are given for the proposed line and for the existing corridors, and is illustrated in profile in Figure 4-2.

Electric Fields: Short-term Effects

Short term effects due to transmission line electric fields are associated with perception of induced currents and voltages or perception of the field. Induced current or spark discharge shocks can be experienced under certain conditions when contacting objects in an electric field.

Induced currents are always present in electric fields under transmission lines and would be present near the proposed line. However, during line construction, IPCo routinely grounds fences and metal buildings that are located on or cross the right-of-way. This eliminates these objects as sources of induced current and voltage shocks.

Unlike fences or buildings, mobile objects such as vehicles and farm machinery cannot be grounded permanently. Limiting induced currents to persons from such objects is accomplished in several ways. First, required clearances from ground tend to limit field strengths to levels which do not represent a hazard or nuisance. The NESC (1990) requires

CHAPTER 4

that sufficient conductor clearance be maintained to limit the induced short-circuit current in the largest anticipated vehicle under the line to 5 milliamperes (mA) or less. This can be accomplished by limiting access or by increasing conductor clearances in areas where large vehicles could be present.

Impacts of electric field coupling can be mitigated through grounding policies and through adherence to the NESC. Worst-case levels are used for safety analyses but, in practice, currents and voltages are reduced considerably by inadvertent grounding. Shielding by conducting objects, such as vehicles and vegetation, also reduces the potential for electric field effects.

Transmission Line Magnetic Fields

The calculated values of magnetic field at 1-meter height for the proposed and existing lines are given in Table 4-6. Field values on the right-of-way and at the edge of the right-of-way are given for average and maximum continuous current conditions. Lateral profiles of maximum magnetic field under average and maximum conditions are given in Figure 4-3 for the proposed 500kV lines alone and with an existing 345kV line (Case 4 in Figure 4-1). The actual magnetic field levels would vary considerably as current on the lines varies.

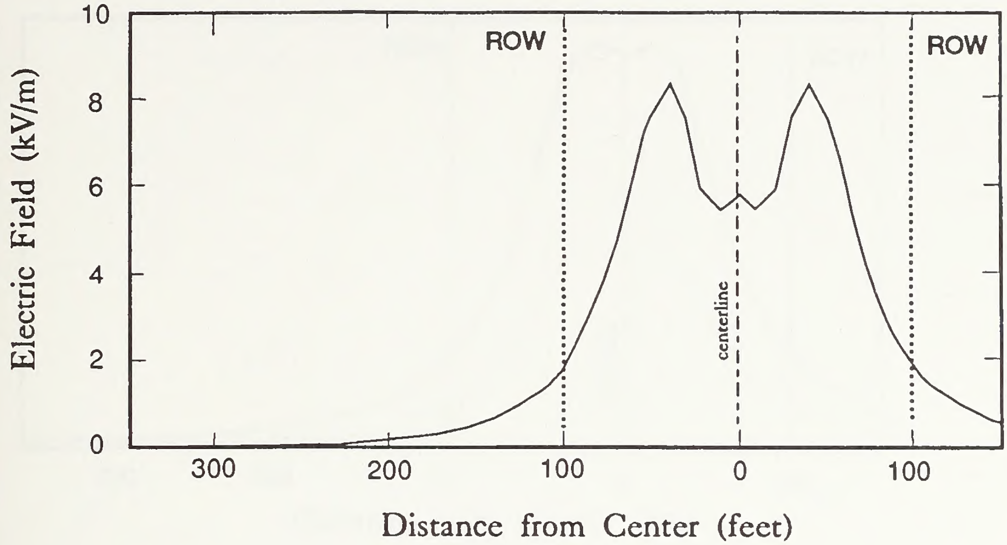
The peak magnetic field expected on the right-of-way of the proposed line under average current conditions is 118 mG. The peak calculated magnetic field under the existing lines with average current is 133 mG for the existing Midpoint-Summer Lake 500kV line (Cases 7 and 8 in Figure 4-1). Under maximum continuous current conditions which might be experienced over short periods during the year, the peak fields on the proposed right-of-way would be 230-237 mG depending on the corridor. The peak fields under the existing Midpoint-Summer Lake 500kV lines is 277 mG.

The parallel DC line in Case 12 generates DC magnetic fields similar to the earth's field. This DC magnetic field would be superimposed on the 60 Hz field from the proposed line. However, just as the earth's field does not affect the 60 Hz field, the magnetic field from the DC line would not impact the 60 Hz field or the currents induced by the 60 Hz field.

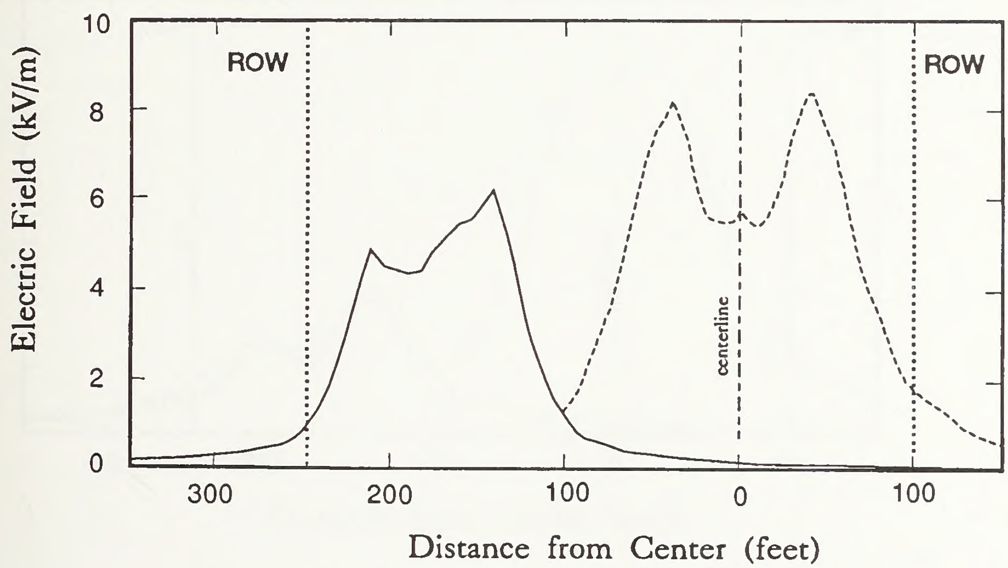
At the edge of the right-of-way near the proposed line, the calculated fields for average current load conditions are 27 to 31 mG depending on the corridor. The fields at the other edge of the corridor range from 4 to 40 mG. Under maximum continuous current conditions, the field at the edge of the right-of-way nearest the proposed line ranges from 55 to 62 mG. At the other edge of the right-of-way the fields range from 9 to 74 mG.

The magnetic field levels associated with the proposed line configurations are generally comparable with fields from the existing 500kV line along a portion of the route and from other 500kV transmission lines as characterized in Table 4-6. The levels at the edge of the right-of-way are comparable to the fields measured one foot away from some small appliances such as hair dryers, electric shavers, mixers, and portable heaters. [Gauger, 1985] At a distance of 200 feet from the edge of the right-of-way the fields from the proposed line are 3 and 6 mG for average and maximum current conditions, respectively.

Proposed 500kV transmission line



Existing 138kV with proposed 500kV transmission lines

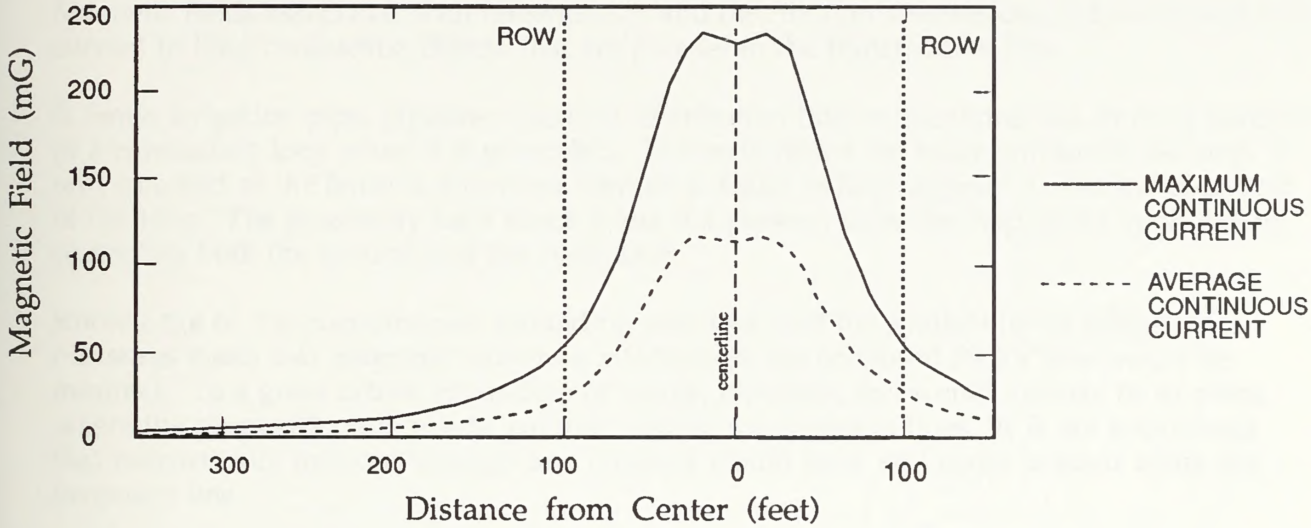


Note: Maximum voltage and minimum clearences have been used.

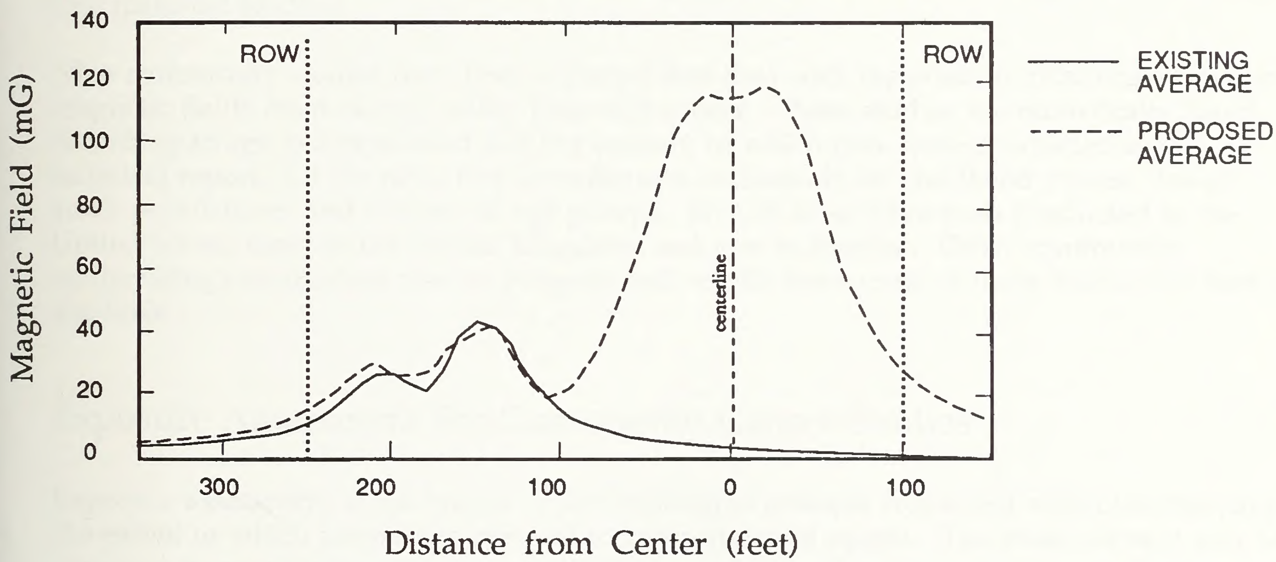
Source: T. Dan Bracken, Inc.

Electric Field Profiles

Proposed 500kV transmission line



Existing transmission lines and the proposed 500kV transmission line



Source: T. Dan Bracken, Inc.

Magnetic Field Profiles

Magnetic Field: Short-Term Effects

Magnetic fields associated with transmission and distribution systems can induce voltage and current in long conducting objects that are parallel to the transmission line.

A fence, irrigation pipe, pipeline, electrical distribution line or telephone line forms a portion of a conducting loop when it is grounded. The earth forms the other portion of the loop. If only one end of the fence is grounded then an induced voltage appears across the open end of the loop. The possibility for a shock exists if a person closes the loop at the open end by contacting both the ground and the conductor.

Knowledge of the phenomenon, grounding practices, and the availability of mitigation measures mean that magnetic induction effects from the proposed 500kV line would be minimal. To a great extent, grounding of fences, pipelines, etc. would already be in place where the proposed route would parallel existing transmission lines. It is not anticipated that magnetically induced voltages and currents would have any major impacts along the proposed line.

Epidemiologic Studies

The epidemiology literature concerned with magnetic fields and cancer contains studies that focus on either (1) the general population (community studies) or (2) working populations (occupational studies).

Nine community studies have been reported that deal with the possible relationship between magnetic fields from electric utility lines and cancer. These studies are numerically listed according to age group studied and the country in which they were conducted in the technical report. Of the nine, five have focused exclusively on childhood cancer, two on adult populations, and two on all age groups. Five of these have been conducted in the United States, three in the United Kingdom, and one in Sweden. Other community epidemiology studies are now in progress and results from some of these studies are now available.

Exposure Assessment For Community Cancer Studies

Exposure assessment is the branch of environmental sciences concerned with characterizing the extent to which people are exposed to environmental agents. The most relevant way to express a person's exposure to magnetic fields, and indeed to any environmental factor, is in terms of total individual exposure. Total exposure for each person includes the contribution from transmission lines, distribution lines, domestic appliances, and sources in the workplace or at school. Unfortunately, none of the magnetic field epidemiology community studies reported to date (i.e, those listed in Attachment A) were conducted at the level of the individual person to either directly quantify or estimate total exposure to magnetic fields.

The methods that have been used thus far to assign magnetic field exposure values are summarized in the following brief descriptions. The first two discussed (wiring codes and spot measurements) are particularly relevant to the key studies in this area:

Wiring Codes: The most widely cited studies have included wiring codes as an index of exposure. The use of wiring codes as a residential magnetic field exposure surrogate is based on the postulate that the nature of the electric utility wiring outside a house predicts the relative magnitude of the magnetic field within a home, and, therefore, predicts the magnetic field exposure of the home's residents. For virtually every home this wiring includes the neighborhood distribution line. In rare cases, up to perhaps one or two percent of an entire study population, does outdoor wiring adjacent to a home include overhead transmission lines (Wertheimer and Leeper, 1979; McDowall, 1986; Tomenius, 1986). When considering the issue of the cumulative exposure of large populations to magnetic fields from outdoor utility wiring, transmission lines play a negligible role. Because of the lack of a sizable abutting population none of the community epidemiology studies conducted to date have been able to evaluate large populations near transmission lines.

In 1979, Wertheimer and Leeper introduced a wire coding scheme that classified distribution lines in the Denver area, according to both their current carrying capacity and distance from the residence. The objective of this coding system was to identify distribution lines that generate high and low levels of magnetic fields in the adjacent homes, without having to actually enter the homes and conduct measurements. Homes were labeled as belonging to either the high current configuration (HCC) category or the low current configuration (LCC) category. One of the immediate uncertainties about this coding scheme was whether or not it truly represented actual field levels in the home. Studies conducted subsequently by Savitz (1987) and Kaune et al (1987 a,b) have both shown that, although wiring code rank correlates with measured magnetic field, the correlation is relatively weak. Of course, any wire coding scheme still fails to account for exposure an individual receives when away from the residence or exposures within the residence unrelated to the distribution lines.

Spot Measurements: The term "spot measurement" refers to a measurement of the magnetic field strength at a single point in time. The main advantage of spot measurements is that they provide a direct measure of indoor exposure levels. Their disadvantages are that (a) they do not reflect temporal variations in the field, which do undergo daily cycles, and (b) they do not account for exposure from local sources, such as appliances.

Calculated Fields: Based on information on the electric loads carried on power lines, the lines' physical characteristics (e.g., height of wires from ground), and their distance to residences, the magnetic fields due to power lines can be calculated. These calculations are accurate when a power line is the sole outdoor magnetic field source.

Distance from Source: Magnetic field strength increases as the distance to a line carrying current decreases.

The studies conducted to date, when analyzed collectively, fail to substantiate a link between magnetic field exposure and an increased risk of cancer. As explained below, a major problem in interpreting this literature is the lack of consistent results across, and also within studies.

Perhaps the most widely known of all the community studies is the childhood cancer study conducted by Savitz and colleagues. This study was conceived as a replication of a 1979 study by Wertheimer and Leeper, who had reported that wiring codes were associated with childhood cancer in the Denver area. Savitz reported that cancer was weakly associated with wiring codes, and that the association was statistically significant. In contrast, when the low-power measured magnetic field (i.e., field measured with in-home power consumption minimized), rather than wire code, was used as the index of exposure, the association of exposure with disease appreciably weakened, and was no longer statistically significant. For high power fields (residential power turned on), no association was observed. Savitz questions the lack of an association of cancer with high-power fields, the weak relationship with low-power magnetic fields, and the positive relationship of cancer with wiring code:

> "High power fields more closely reflect the actual in-home exposure conditions when the home is in use. The supposed noise in measurement from superimposing internal and external sources of magnetic fields would actually be a more complete picture of the exposures associated with living in that residence. Low power magnetic fields would reflect that less accurately, and wire codes would be a more distant proxy measure of such exposures." (Savitz, 1987)

Thus, the study by Savitz and co-workers, though better executed than the study of Wertheimer and Leeper, did not produce internally consistent data indicating that residential magnetic field exposure levels are associated with excess risk of cancer.

Two studies, both conducted in the U.S. have examined the association of magnetic fields with cancer in adults. In 1982, Wertheimer and Leeper published a study conducted in the Denver area in which they report that adult cancer was positively associated with wiring code. Like their childhood study published in 1979, measures of magnetic field strength inside the study homes were not taken. The second study of adult cancer was conducted in the Seattle, Washington area, and focused only on acute nonlymphocytic leukemia, rather than on all cancers (Severson et al, 1988). A rationale for this selection was that a number of occupational epidemiology studies had reported an excess of acute leukemias among workers in electrical occupations (e.g., electrician, utility linemen).

The Severson/Stevens/Kaune study assessed indoor exposure levels in three ways:

- the Wertheimer-Leeper wiring code
- the wiring code that Kaune developed for this project, which provides improved correlation with magnetic fields
- both low-power and high-power indoor magnetic field measurements

None of these three estimates of magnetic field exposure was associated with the incidence of leukemia. The authors concluded:

> "There was no consistent evidence of an increased risk of acute nonlymphocytic leukemia associated with residential exposure to power-frequency magnetic fields. None of the risk estimates were significantly greater than 1.0, and no convincing dose-response relation was observed for the various measures of exposure that were considered in this study." (Severson et al, 1988)

The other epidemiologic studies that have been conducted in community settings have produced mixed results. A number have failed to detect an association between proximity to magnetic field sources and cancer (Fulton et al, 1980; Myers et al, 1985; Coleman et al, 1989; McDowall, 1986), while one other has reported a positive association (Tomenius, 1986).

Other Exposure Sources for Community-Based Studies

Electric blankets are a source of particular interest, because (a) the magnetic field they produce is high (roughly 20 mG) relative to average ambient background in rural areas (about 1 mG); (b) exposure takes place over the course of hours, in contrast to many appliances (e.g., blenders) for which exposure takes place over the course of minutes or less and; (c) exposure is close to the body.

Savitz et al (1990) re-examined the data sets from the Denver childhood-cancer/ powerline study, but instead of wiring codes and spot measurements, they focused on reported use of appliances. These included electric blankets, heated water beds, bedside electric clocks, and heating pads, all of which have the potential to involve extended exposure. For most of the positive findings in this study, some of which achieve statistical significance, the estimates of risk are imprecise, and further research would be required to unravel the meaning of the results presented.

Several population-based studies have been conducted on the potential association between childhood tumors of the nervous system and parental occupations. Spitz and Johnson (1985), as well as Wilkins and Hundley (1990) are careful to point out that chemical exposures in the occupations under study need to be factored in to epidemiologic analyses that address EMF. Two other population based-studies, Johnson and Spitz (1989) and Nasca et al (1988), also examined tumors of the central nervous system among children and again found no consistent pattern.

Occupational Studies

Within the past decade many studies have evaluated the association between employment in an occupation that includes presumed magnetic field exposure and cancers of various types. These studies have taken a variety of approaches and have produced mixed results, some

reporting slight, but statistically significant, elevated rates of leukemia or brain cancer among workers in electrical occupations, and other studies reporting no apparent association.

A key issue within the occupational literature is that most of the investigators have been unable to adequately control their data for the potential effects of simultaneous exposure to chemicals. For example, in a study of leukemia deaths at the Portsmouth Naval Shipyard, Stern et al (1986) identify potential confounding exposures for electricians, who had an elevated risk: "Electricians may frequently encounter exposures from metal fumes (i.e., nickel, chromium, iron, or lead, etc.), solvents (including benzene), fluxes, chlorinated biphenyls, epoxy resins, chlorinated naphthalenes, and electrical current." The inability to evaluate exposure to electric and magnetic fields separately from other chemicals complicates studies of brain cancer as well. Thomas et al (1987) reported a statistically significant increase in brain tumors in a group of men in electrical and electronics work. These investigators concluded, "Our data suggest that certain jobs involving ... electronics or electrical equipment involve exposures that are related to excess risk of astrocytic brain tumors. Because these jobs may involve a wide variety of exposures, a specific etiologic [causative] agent cannot be identified from the present data."

The second weakness in occupational studies is that exposures to magnetic fields have not been not directly measured, a problem quite similar to that found in residential studies. Those who investigate occupational exposures have had to rely on occupation, often as reported on the death certificate, or on job title as a surrogate to indicate presence of exposure.

The literature on occupational exposures is too extensive for each study to be reviewed in detail in this document. Nevertheless, the general limitations noted above indicate that conclusions about the possible contribution of electric or magnetic field exposure to cancer cannot be deduced from the occupational literature because of the lack of exposure assessments, and, in most cases, the absence of control for other potential carcinogenic factors. Further occupational research into this issue is continuing.

The epidemiologic studies conducted to date fail to conclusively demonstrate that magnetic field exposure leads to an increased risk of cancer. A universal deficiency in this literature concerns exposure assessment. In no case was total exposure of study subjects to magnetic fields estimated. Rather, exposure was based largely on surrogate measures, such as wiring codes. The best attempts to estimate personal exposure occurred in two community studies in which direct spot measurements of the magnetic fields in subject homes were taken (Savitz et al, 1988; Severson et al, 1988). In neither of these cases was cancer incidence correlated with actual magnetic field strength.

Because virtually all studies include some level of uncertainty about data quality, decisions about causality are predicated, not on the findings of a single study, but on the entire body of literature available. Select key factors to be taken into account in determining causation include (see HEW, 1964; Hill, 1965):

- Consistency - The results from epidemiologic studies of different designs on different populations should be in reasonable agreement with one another.

- Strength of association - Causative arguments are strengthened when the relative risks are high and when the associations between exposure and effect are statistically significant. For high-level associations of exposure with disease, risk estimates can tolerate imprecision. The risk of lung cancer from asbestos exposure (relative risks between roughly 5 and 20), especially among cigarette smokers (relative risks between roughly 25 and 50), is an example of a strong association (Hammond et al, 1979; Selikoff et al, 1980; Berry et al, 1985).

- Coherence - causation is more plausible if it can be based on known scientific principles or established findings. Coherence, thus, may rely on data from scientific disciplines other than epidemiology (e.g., laboratory research).

- Dose-response relationship - The magnitude of the association should increase with increasing exposure. For example, higher exposures to radon gas lead to higher risks of lung cancer.

Thus, the epidemiology studies conducted on magnetic fields and cancer, considered as a body of information, fail to satisfy criteria traditionally considered in assessing causation. The studies are inconsistent, do not have particularly strong associations, lack coherence and fail to demonstrate a positive relation between exposure and response. On the weight of this evidence, one cannot conclude that magnetic fields cause cancer.

Reproductive Outcome

Only two studies concerned with the potential effect of electric and/or magnetic fields on pregnancy outcome within community populations have been published as full papers. The sources of exposure to the fields in these studies were electric blankets and electrically-heated waterbeds (Wertheimer and Leeper, 1986) and ceiling cable heat (Wertheimer and Leeper, 1989). A third study on malformations and use of electric blankets and electrically-heated waterbeds was recently presented by Dlugosz et al (1990). None of these studies examined the association between pregnancy outcome and exposure to fields from transmission or distribution lines, nor did they include actual measures of field exposure.

Wertheimer and Leeper (1986) attempted to determine whether or not the use of an electric blanket or heated waterbed influenced several reproductive parameters, including gestation time, birth weight, and fetal loss due to miscarriage. (Although electric blanket and heated waterbeds both produce user exposure to electric and magnetic fields, they also produce heating, which has been associated with adverse reproductive outcome (e.g. congenital malformations) in both humans and animals. The potential confounding influence of heating is acknowledged by the investigators.) Of these, gestation, birth and limited demographic data (from published records), and information about electric blanket and waterbed use (from telephone survey) were available for only 29 percent of the base population. In addition, no data were collected on potentially confounding exposures, such as smoking, alcohol and drug use, all of which may exert adverse effects on reproduction (e.g. retarded growth, congenital malformations) (Kalter and Warkany, 1983).

Several other problems in design and analysis beset this study. First, gestation time and birthweight are not expressed in terms that are appropriate for the assessment of environmental effects. Both gestation time and birth weight fluctuate from birth to birth and the norms for these two parameters span a range. (For example, a normal gestation period is between 38 and 42 weeks.) Wertheimer and Leeper do not express their data in a format that one can tell if unexposed and exposed groups were within the norm or if one group was different from the another in a meaningful way. Second, fetal loss was not expressed on the basis of the number of pregnancies at risk, but rather in a totally unorthodox fashion on the basis of subsequent livebirth. The bias this approach introduces may be appreciable but cannot be estimated with the available data. Therefore, the study design and sample selection scheme used by Wertheimer and Leeper are inadequate for assessing potential effects of electric blanket and waterbed use on pregnancy outcome.

Laboratory Studies

Cancer

The weak association between wiring configurations of distribution lines outside of homes and the occurrence of childhood cancers observed in some epidemiological studies has raised the possibility that exposure to magnetic fields may in some way influence the development of cancer. A number of laboratory studies have investigated responses that bear upon this question. Biological responses to electric and magnetic fields that may be relevant to the appearance of cancerous tumors, and to stages in the development of those tumors in animals, have received considerable study.

Cancer development is generally divided into three sequential stages: initiation, promotion and progression. Initiation is an irreversible step, likely to involve damage to the cellular genetic material (DNA). Promotion, the second event, involves the growth of initiated cells. This step, unlike initiation, does not usually involve damage to the DNA, and hence is reversible. Progression, the final stage, is believed to involve further changes to the DNA, and like initiation is irreversible.

Tumor Initiation - The ability of electric and magnetic fields to produce mutations to the genetic material of cells and so lead to initiation has been studied in whole animals and in a variety of cells in vitro.

Some investigators have examined chromosomal abnormalities in blood cells taken from workers in high voltage facilities. Bauchinger et al (1981) reported that white blood cells from these workers showed no increase in chromosome abnormalities. However, other researchers (Nordenson et al, 1984, 1988) showed a larger number of chromosomal abnormalities in substation workers. These authors convincingly argued (Nordenson et al, 1984) that the observed chromosomal alterations were not attributable to electric field exposure, but may have resulted from spark discharges received by substation workers in the course of their work.

CHAPTER 4

In summary, there is a consensus among studies of cells from a variety of species (including human), that exposures to either or both electric and magnetic fields, at a range of intensities, in vivo or in vitro, are unable to produce damage in the DNA or chromosomes of a variety of cells.

Tumor Promotion and Tumor Progression - The biology of tumor promotion and progression are not as well understood as that of initiation. For a tumor promoter to act, it is generally required that cells must have first been initiated. In fact, a tumor promoter administered to an animal in the absence of prior initiation does not generally cause tumor promotion. Unlike the situation for initiators, there is no general agreement on the validity of specific assays for the identification of tumor promoters or progressors (Yamasaki, 1988; Langenbach et al, 1988).

During in vivo studies for tumor promotion to determine if electric fields promoted the growth of mammary tumors, Le Bars et al (1983) exposed rats to a 50 kV/m electric field for one and one-half months before, and for 7 months after receiving a chemical initiator. There was no difference between control and exposed rats in the time of tumor appearance, the number of tumors per rat, or the histological appearance of the tumors that developed. The study by Leung et al (1988) used a similar experimental design to Le Bars et al (1983), although the electric field exposures were of shorter duration and lower field intensity.

Most recently, Buntenkotter et al (1990) examined the development of mammary tumors in female rats first fed a chemical initiator followed by no exposure, sham-exposure or exposure to 30 mT (300,000 mG) magnetic fields for 91 days. (No positive control was included in the experiment). This study reported that exposure to magnetic fields had no effect on promotion. Therefore, no consistent effect of exposure of rats to electric or magnetic fields has been observed on the development of mammary tumors.

During in vivo studies in a series of experiments examining tumor progression, Thomson et al (1988) first injected mice with leukemia cells and then exposed the animals to 60 Hz magnetic fields of up to 5 G for five days each week (six hours per day) until death. Control mice were injected with tumor cells but not exposed to magnetic fields. Several indicators of the progression of leukemia were examined and no effect of magnetic field exposure was observed on the progression of the disease. A limitation of this assay is that the follow-up time is short so that control and experimental mice survive for only two weeks after injection of cells.

Still other studies have found no consistent capability of either electric or magnetic fields to enhance the development of established tumors. These include:

- the effect of long-term exposure to a 50 kV/m electric field on spontaneous development of leukemia in the AKR mouse (Le Bars et al, 1983; Le Bars et al, 1988)

- the time of appearance and weight of neuroblastoma tumors transplanted to mice and followed by 16 days of exposure to a 12 G magnetic field (Batkin and Tabrah, 1977)

- the survival of mice repeatedly exposed to 1.6 G magnetic fields following transplantation of mammary carcinomas (Chandra and Stefani, 1979)

In Vitro Studies - Since a characteristic often associated with tumor promotion is alteration of growth properties, many investigators have examined the results of exposure to electric or magnetic fields on the rate of cell growth and DNA synthesis in different types of cells in vitro (Liboff et al, 1984; Whitson et al, 1986; Adolphe et al, 1987; Basu, 1987; Cohen, 1987; Noda et al, 1987; Rodan, 1987). However, many of these studies fail to show any effects of electric and magnetic fields on cell growth or DNA synthesis.

Possible effects of electric or magnetic fields on biochemical measurements of enzymes believed to be 'markers' of growth or proliferation have also been examined. They reported that the intermittent exposure of various cell types in vitro to electric fields of 10 mV/cm for one hour increased the activity of ornithine decarboxylase (ODC) by 175-500 percent. From these data the authors have suggested that because electric fields induce ODC activity they could also induce tumor growth. This, however, is by no means the only -- nor the most likely -- explanation for their findings.

In summary, investigation of the responses of animals and many kinds of cells in vitro has not revealed that the growth, proliferation or any other parameter that would be indicative on cancer-initiating, cancer-promoting or cancer-progressing responses is affected to any significant extent by exposure to 60 Hz electric and magnetic fields. The appearance of tumors, stimulation of cells to uncontrolled growth or damage to DNA have not been observed consistently in well-controlled and reproducible experiments that exposed animals or cells to 60 Hz electric and or magnetic fields. A few isolated reports which have suggested that exposure to these fields may lead to DNA damage or to alterations in the growth potential of cells have failed to be replicated in subsequent, more comprehensive studies. Thus, the experimental data available to date fail to support the suggestion that exposure to 60 Hz electric or magnetic fields may be associated with an increased risk of cancer development.

Studies of Cellular Function

Production of RNA and Proteins - Protein synthesis is an essential and continuous activity of cells. The process of protein synthesis involves the production of messenger ribonucleic acid (mRNA) molecules from the DNA template and translation of the mRNA into proteins. Goodman and colleagues have investigated the effects of electric and magnetic fields on RNA transcription and the production of proteins (Goodman and Henderson, 1986; Goodman et al, 1987; Goodman and Henderson, 1988; Goodman et al, 1988, 1989a, 1989b).

More recently Goodman et al (1988, 1989a, 1989b) have run similar experiments using a human cell line, Hl-60. They have reported that exposure of these cells to electric and magnetic fields also results in changes in RNA transcription and protein synthesis. Preliminary results from a study of similar design reported different results (Skowronski et al

1990). The investigators found that exposure of Hl-60 cells to 10 G magnetic fields resulted in an increase in RNA transcription.

Since changes in transcription are part of the normal repertoire of cellular responses to various stimuli, these data in themselves are not indicative of a harmful effect.

Studies of Immunological Function

The immune system is the body's first line of defense against disease. The function of the immune system is to recognize and destroy substances identified as "foreign" to the organism. These can be chemicals, bacteria, viruses, or cells that have acquired altered characteristics, such as cancer cells.

Many studies have been performed to evaluate the effect of exposing humans, mice or rats to 60 Hz electric and/or magnetic fields on the function of the immune system (Morris and Ragan, 1979; Morris and Phillips, 1982; Ragan et al, 1983; Seto et al, 1986; Fotopoulos et al, 1987; Morris 1989, Graham et al, 1990). None of the in vivo assays show that electric and/or magnetic fields affect the competence of the immune system.

Further analyses of the effect of electric and magnetic fields on immune function have been performed using isolated immune cells in vitro. Winters (1987) exposed canine and human lymphocytes to electric, magnetic or combined fields and they did not observe any effects in levels of cell surface antibodies or specific receptors.

Adverse effects on the immune system from exposure to 60Hz electric and/or magnetic fields have not been demonstrated by in vivo data. Since the in vitro data are inconsistent, they require replication with further in vitro assays and verification in an in vivo system.

Studies of Endocrine Function

A number of studies have examined the effect of electric fields on endocrine function (Free et al; Seto et al, 1984; Quinlan et al, 1985; Wilson et al, 1981; 1983; 1986; 1988; Maresh et al, 1988). Most of these studies show no effect on endocrine parameters.

The only consistent endocrine response that has been reported is the reduction in the peak secretion of the hormone melatonin from the pineal gland during the night. This has been observed in albino rats continuously exposed to electric fields (Wilson et al, 1981; 1983; 1986; 1988) for at least three weeks. The levels of melatonin release nevertheless return to normal values within as few as three days after exposure with no apparent effects.

Reproduction

Numerous experiments have been performed to examine any possible effects of 60 Hz electric and/or magnetic fields on reproduction and fetal development. Several animal species have been used, and as a whole, the published reports in this area provide no conclusive evidence that such exposure constitutes a reproductive health hazard.

Some of the studies have exposed successive generations of mice continuously to 60 Hz electric fields. The purpose of such studies is to determine whether electromagnetic exposure could cause genetic mutations that might not show up in the offspring of exposed parents, but would affect later generations. Seto et al (1984) conducted a multigenerational study in which rats were exposed for four generations to a 60 Hz electric field strength of 80 kV/m. Conception, birth, and growth of each generation of offspring all occurred in the field. Based on examinations of more than 2600 offspring showed that electric field exposure produced no effects on fertility, nurturing, survival, or sex ratio. Benz et al (1987) conducted an investigation of potential multigenerational influences. In each generation data were taken for several parameters of reproductive importance, such as: impregnation rate, litter losses, litter size, gestation time, postnatal growth and survival, and sex ratios. None of these endpoints were affected.

Reproductive studies have also been conducted focusing specifically on 60 Hz electric field effects on in utero development. Sikov et al (1984), female rats were exposed to an electric field strength of 65 kV/m in one of three ways:

- From before mating through gestation
- From the beginning of gestation to 8 days post-natally
- from the 17th day of gestation to 25 days post-natally (Sikov et al, 1984). Each exposure lasted thirty days

None of these exposures produced effects on malformation rates and/or resorption, survival, or growth.

In a subsequent experiment on rats using the same electric field exposure strength as Sikov et al (1984), two replicates (i.e., repetitions) were carried out. The results of the two replicates differed. One replicate showed no deleterious effects on reproduction. In the other, however, female offspring that had been raised in the field were less fertile and their litters had more malformations than the exposed animals. The authors speculated that the differing results reflected biological variation among groups of animals.

Though most studies tested for potential effects of electric fields on reproductive outcomes, several studies have also been conducted with magnetic fields using mice (Fam, 1981) or rats (Brinkmann et al, 1988, Rommereim et al, 1990). None of these studies have shown any effects of magnetic field exposure on pregnancy outcomes or malformations. Although some of the studies cited have reported changes in reproductive outcome, the weight of evidence from animal experimentation supports the conclusion that 60 Hz electric exposures are not harmful to reproduction and development. When these infrequent positive results are considered among the studies that have reported no effects whatever, it is reasonable to

conclude that there is very little likelihood that 60 Hz electric fields adversely affect reproductive processes. This conclusion was shared by the Scientific Advisory Panel of the New York State Power Lines Project in their evaluation of the possibility that the 60 Hz power transmission electrical environment could affect reproduction:

> "There is currently no convincing evidence for field effects on fertility or growth. Further animal studies would not seem warranted for these variables." (PLP, 1987, p. 133).

Physiological Systems

Numerous laboratory studies have been conducted to address the question of whether 60 Hz electric and magnetic field exposure could affect the performance, physiology or associated cognitive states of the nervous system. The specific questions asked have been the following:

- can electric or magnetic fields be perceived?
- can these fields modify the performance or responses of individuals, regardless of whether or not there is conscious perception of the fields?
- is exposure to electric and magnetic fields detrimental to individuals?

Although several studies have examined the general health of human or animal subjects exposed to electric and/or magnetic fields, few have been as thorough and well-controlled as the recent report by Graham and Cohen (1987). These investigators performed a comprehensive evaluation of possible effects of electric and magnetic fields on human performance, physiology, and subjective state. They created a unique, 60 Hz human exposure facility designed to generate electric (0-16 kV/m) and magnetic fields (0-400 mG) in a controlled laboratory environment. They used this facility to evaluate human physiological, sensory, neural, motor, perceptual and cognitive function (e.g. respiration, heart rate, visual acuity, focused attention, short-term memory, time perception, information processing and decision-making).

There were no responses to field exposures for the overwhelming majority of the physical, biological and psychological measures that were examined. No significant effects were observed on sleep, appetite, sexual activity, cognitive and physical functions, or on several measures of mood (e.g. vigor, anger, fatigue, confusion, depression). Furthermore, no significant effects were observed on the majority of the vital signs (e.g. blood pressure, oral temperature, skin conductance).

Other researchers have conducted experiments with electric and/or magnetic fields at the whole animal level on a large variety of endpoints that involve behavior, neurological development, and neurochemical metabolites in body fluids. In many cases, these experiments were conducted with field strengths much higher than those found commonly in human environments, or were conducted under extremely specific conditions that are not realistic in terms of human experiences and activities. While some investigators have reported observing biological changes, none of these changes is interpretable in terms of the health of people resident near transmission lines.

CULTURAL ENVIRONMENT

Cultural Resources

Introduction

Cultural resources within the project area are subject to both direct and indirect impacts. Direct impacts would result from terrain disturbance associated with construction activities, such as clearing vegetation, installing tower foundations, assembling and erecting towers, stringing and tensioning conductors, upgrading existing access roads, constructing new access roads, and any restoration and revegetation measures.

Cultural resources also could be subject to indirect impacts, and two types were evaluated. First, increasing general public accessibility to currently remote areas was considered. A major factor in the preservation of many archaeological and historical sites within the region is the relatively low intensity of land use. Increasing accessibility to remote areas could lead to degradation of cultural resources as a result of inadvertent damage due to uncontrolled recreational use or overland vehicle travel, or by facilitating intentional vandalism. Visual intrusions are another form of indirect impacts that were considered. A new transmission line could degrade some historic properties whose settings are important aspects of their historic values.

Methods

The assessment of direct impacts considered recorded resources and projected sensitivity zones, both of which were classified into resource quality categories as described in the technical report (Rogge and Woods 1992). The ratings for each site were entered into a GIS database. Each "grid cell" within the GIS database (approximately 100 meters square) was therefore associated with a cultural resource sensitivity rating.

Direct construction impacts were also modeled for each link using the GIS. The model included a level of disturbance based on tower pad and assembly areas per mile of line, plus a varying amount of access road development based on estimates of the extent of new access roads that might have to be developed. The estimates of access road requirements were based on consideration of the number of existing roads and the steepness of the local terrain, which is a crucial factor in determining whether access beyond the transmission line right-of-way would be needed.

The GIS was then used to compare the resource quality ratings for each grid cell with the projected degree of direct disturbance. These comparisons resulted in impact ratings for each grid cell of high, moderate, low, and no impacts. Those ratings were then accumulated for each link to facilitate link and route comparisons.

Indirect impacts due to increased public accessibility were modeled by estimating the relative increase in roads that could result from implementation of the project. The varying levels of increased accessibility were rated and segments of the alternative links were classified accordingly. The GIS was again used to compare cultural resource quality ratings, this time using the known resource database only, with these projected indirect impacts. The resulting impact ratings of high, moderate, low, and no impacts, were then totaled for each link.

Indirect visual impacts were analyzed on 36 previously recorded sites. These sites were selected for viewshed analysis because their settings could be an important aspect of their historic values (that is, they were significant for more than their information potential), and there could be substantial sentiment for preservation in place. The analysis considered distance to the proposed transmission line and the level of contrast within the local environmental setting (see the Visual Resource section for further details).

More details about the methods used to assess both direct impact and indirect impacts are presented in the technical report (Rogge and Woods 1992) (also refer to Appendix H for the locations where technical reports can be reviewed).

Results

The GIS was used to combine considerations of the direct and indirect impact models for each of the 11 proposed alternative routes. The number of miles rated as having a composite impact rating of high, moderate, low, and no impacts were tabulated for each of the alternative routes. (The centerline report, an accompanying data volume, lists the impact ratings associated with mileposts along the centerline of each link.)

To generate composite impact scores for each alternative route the relative importance of the ratings was weighted as follows. A value of 1 was assigned to each mile rated as having no impacts. Low impact zones were assigned a weighting of 2, and moderate impact zones were given a weighting of 5. High impact zones were weighted with a factor of 20 to reflect the efforts that might be required to avoid or mitigate impacts within these zones.

The resulting impact scores indicated that from a cultural resource perspective Route C (with an impact index of 1182) is the preferred route. It is one of the shortest routes and crosses less than 6 miles of projected high impact zones. Alternative Routes A and G are scored very similarly to Route C (1190 and 1197 respectively). Alternative Routes F and B are somewhat less preferable (with index scores of 1239 and 1267 respectively), and Routes D and E are the least preferred (scored 1279 and 1295 respectively).

None of the Midpoint to Dry Lake alternatives can avoid crossing some major resources such as the Oregon Trail, California Trail, and the Pony Express route. However, only somewhat more than one percent of each of the routes crosses what are projected as high impact zones. The range of variation among these alternative routes is not all that great from a cultural resource perspective, and is unlikely to be very significant in consideration of the margins of error associated with the models of resource sensitivities and projected impacts.

From a cultural resource perspective, the Direct Route is the preferred alternative among the Ely to Delta crossties (with an impact index of 314). It is the shortest route by almost 20 miles and crosses about 4.6 miles of projected high impact zones, and less than 20 miles of moderate zones. The Cutoff Route is the next preferred alternative (with an impact index of 394). It also crosses about 4.6 miles of projected high impact zones and 33 miles of moderate impact zones. The 230kV Corridor route is ranked third from a cultural resource perspective (scored 471). It crosses about 5.5 miles of projected high impact zones and 40 miles of moderate impact zones. The Southern Route is the least preferred (scored 643) because it crosses more than 11 miles of high impact zones, 41 miles of moderate impact zones, and is about 50 miles longer than any of the other crosstie alternatives.

Mitigation Measures

Mitigation potential is considered to be very high for most of the types of cultural resources that are likely to be present within any of the corridors. The proposed transmission line is relatively flexible within any given corridor. Once the results of a detailed cultural resource inventory are available, the alignment or the tower sites within the selected corridor can be shifted to some degree to avoid or minimize direct or indirect impacts. Alternatively, many of the resources likely to be affected would be significant for their information potential, and these data can be retrieved through professional study prior to construction resulting in minimal residual impacts.

The project would be implemented in compliance with Section 106 of the National Historic Preservation Act and the project specific programmatic agreement negotiated in accordance with that act. The compliance process would guarantee that regulatory agencies and interested parties would have opportunities to participate in further consultations. In sum, the available data indicate some variation among the routes but not a substantial amount, and there is high potential to satisfactorily mitigate most adverse effects identified as a result of subsequent detailed surveys within the selected route. Therefore, cultural resource considerations are not a crucial factor in selection among the alternatives.

Alternative Routes - Midpoint to Dry Lake

Route A

Route A is approximately 513 miles long. A little over 1 percent of the route (6.8 miles) was rated as having potentially high impacts. About 104 miles were rated as having moderate impacts, and the rest of the route was considered to have low or no identifiable impacts.

The potential high direct impacts would be related to the California Trail crossing (Link 1612), and predicted high sensitivity zones along Deep Creek (Link 40 and 50), Salmon Falls Creek (Link 72), Sagehen Springs and Salmon Falls Creek (Link 130), and Dry Canyon Spring (Link 293).

Visual intrusion into the settings of the Minidoka Relocation Center (Link 20), the Oregon Trail (Link 41), the historic Shafter town site (Link 211), the Pony Express/Lincoln Highway route (Link 291), the California Trail (Link 1612), and the City of Rocks archaeological district (Link 362).

Route B

Route B is approximately 516 miles long. A little more than 1 percent (7.4 miles) is rated as being subject to potentially high impacts. About 117 miles are rated as subject to moderate impacts, and the remainder of Route B is rated as having low or no identifiable impacts.

Potentially high direct impacts would be related to a prehistoric rockshelter (Link 91) and the California Trail crossing (Link 140). Other potentially high direct impacts would be related to projected sensitivity zones along the Deep Creek (Links 40 and 50), Salmon Falls Creek (Link 72), and Texas Spring Canyon (Link 92).

Other potentially high impacts related to direct and indirect impacts would be due to increased access in the vicinity of the Hastings Cutoff crossing, a railroad siding, and an antelope trap (Link 222).

Potentially high indirect visual impacts could result at the Minidoka Relocation Center (Link 20), the Oregon Trail (Link 41), the Hastings Cutoff and a prehistoric antelope trap (Link 222), the Pony Express Route (Link 280), the California Trail (Link 140), and the City of Rocks archaeological district (Link 362).

Route C

Route C is approximately 507 miles long. Somewhat more than 1 percent of the route (5.9 miles) is considered to be subject to potentially high impacts. Approximately 106 miles are rated has being subject to moderate impacts, and the remaining length of the alternative is projected to have low or no identifiable impacts.

Potentially high direct impacts could result at a prehistoric rockshelter (Link 91), the California Trail crossing (Link 140), the Hastings Cutoff crossing (Link 212), and at projected sensitivity zones along Deep Creek (Link 40 and 50), Salmon Falls Creek (Link 72), Texas Spring Canyon (Link 92), and Dry Canyon Spring (Link 293).

Potentially high indirect impacts could result from visual intrusion into the setting of the Minidoka Relocation Center (Link 20), the Oregon Trail (Link 140), the California Trail (Link 140), the Hastings Cutoff (Link 212), the Pony Express/Lincoln Highway route (Link 291), and the City of Rocks archaeological district (Link 362).

Route D

Route D is approximately 514 miles long. A little more than 1 percent of the route (6.6 miles) is considered to be potentially subject to high impacts. About 125 miles are rated as being subject to moderate impacts. The remaining portions of Alternative D are projected to have low or no impacts.

Potentially high direct impacts to known sites are predicted at the California Trail crossings (Link 166 and 180), the Hastings Cutoff crossing (Link 190), and at projected sensitivity zones along Deep Creek (Link 40 and 50), Salmon Falls Creek (Link 72), Sagehen Springs and Salmon Falls Creek (Link 130), Dry Canyon Spring (Link 293), and Duck Creek (Link 245).

Potentially high indirect impacts are predicted due to visual intrusion into the setting of the Minidoka Relocation Center (Link 20), the Oregon Trail (Link 140), the California Trail (Link 140), the Hastings Cutoff (Link 212), the Pony Express/Lincoln Highway route (Link 291), and the City of Rocks archaeological district (Link 362).

Route E

Route E is approximately 524 miles long. Somewhat more than 1 percent of the route (7.8 miles) is considered to be potentially subject to high impacts. About 122 miles are rated as being subject to moderate impacts and the rest of the route is projected to have only low or no identifiable impacts.

Potentially high direct impacts are predicted at the California Trail crossings (Link 1612), the Hastings Cutoff crossing, a railroad siding station and a prehistoric antelope trap (Link 222). Potentially high direct impacts could also result at projected sensitive zones along Deep Creek (Link 40 and 50), Salmon Falls Creek (Link 72), Sagehen Springs and Salmon Falls Creek (Link 130), and at Dry Canyon Spring (Link 293).

Potentially high indirect impacts could result from visual intrusion into the setting of the Minidoka Relocation Center (Link 20), the Oregon Trail (Link 41), the California Trail (Link 1612), the Hastings Cutoff and a prehistoric antelope trap (Link 222), the Pony Express/Lincoln Highway route (Link 291), and the City of Rocks archaeological district (Link 362).

Route F

Route F is approximately 524 miles long. A little over 1 percent of the route (8.2 miles) is considered to be potentially subject to high impacts. About 104 miles are rated as being subject to moderate impacts, and the rest of the alternative is projected to be subject to low or no identifiable impacts.

Potentially high direct impacts to known sites are predicted at the Snake River crossing where numerous historic and prehistoric sites are recorded (Link 61), the Oregon Trail crossing (Link 64), the California Trail crossing (Link 140), and the Hastings Cutoff crossing (Link 212). Potentially high direct impacts could also result at the projected sensitivity zones along Salmon Falls Creek (Link 72), Texas Spring Canyon (Link 92), and at Dry Canyon Spring (Link 293).

Potentially high indirect impacts could result from visual intrusions into the setting of four historic structures and the Kelton Road (Link 61), the Snake River crossing (Link 61), the Oregon Trail (Link 64), the California Trail (Link 140), the historic Shafter town site (Link 211), the Hastings Cutoff Trail (Link 212), the Pony Express/Lincoln Highway route (Link 291), and the City of Rocks archaeological district (Link 362).

Route G

Route G is approximately 505 miles long. A little over 1 percent of the route (7.3 miles) is considered to be subject to potentially high impacts. About 105 miles are evaluated as subject to moderate impacts, and the remaining portions of the alternative are projected to result in low or no identifiable impacts.

Potentially high direct impacts to known sites are predicted at the Hastings Cutoff crossing (Link 212), and one site along Link 151. Other potentially high direct impacts could result at crossings of projected sensitivity zones along Deep Creek (Links 40 and 50), Sagehen Springs and Salmon Falls Creek (Link 130), Chalk Springs (Link 150), and Duck Creek (Link 245).

Indirect visual intrusions could result in high indirect impacts at the Minidoka Relocation Center (Link 20), the Oregon Trail (Link 41), the historic Shafter town site (Link 211), and the City of Rocks archaeological district (Link 362).

Alternative Routes - Ely to Delta

Direct Route

The Direct Route is approximately 133 miles long. A little over 3 percent of the route (4.6 miles) is considered to be potentially subject to high impacts. About 19 miles are evaluated as being subject to moderate impacts, and the remaining length of the route is projected to have low or no identifiable impacts.

Potentially high direct impacts could result at projected sensitivity zones across the Schell Creek Range (Links 262 and 263) and at an unnamed spring northwest of Dipping Tank Spring (Link 265). Potentially high indirect impacts due to increased accessibility are predicted in this same general area (Links 262 and 263), and other high impacts could result from visual intrusion into the setting of the Pony Express route (Link 263), and the Pony Express/Lincoln Highway route (Link 266).

Cutoff Route

The Cutoff Route is approximately 154 miles long. About 3 percent of the route (4.6 miles) is rated as subject to potentially high impacts. About 33 miles are rated as subject to moderate impacts and the rest of the route is rated as subject to low or no identifiable impact.

Potentially high direct impacts could result within sensitivity zones projected at the Schell Creek Range (Links 262 and 263) and at an unnamed spring northwest of Dipping Tank Spring (Link 265). High indirect impacts due to increased accessibility also could result along the Schell Creek Range (Links 262 and 263). Other indirect high impacts could result from visual intrusions into the setting of the Pony Express route (Link 263), the Pony Express/Lincoln Highway route (Link 266), and the Deseret petroglyph panel (Link 268).

230kV Corridor

The 230kV Corridor Route is approximately 161 miles long. A little over 3 percent of the route (5.5 miles) is considered to be subject to potentially high impacts. About 40 miles of this alternative route are rated as being subject to moderate impacts, and the remainder of the alternative route is projected to result in low or no identifiable impacts.

Potentially high direct impacts to sensitivity zones are predicted across the Schell Creek Range (Link 380), and potentially high indirect impacts due to increased accessibility could result in the same area. Other potentially high indirect impacts could result form visual intrusion into the setting of the historic Osceola Ditch (Link 460). High direct and indirect impacts, including visual intrusion, could result at the crossing of the Nevada Northern Railroad (Link 370). This segment of the railroad, extending from McGill Junction to Keystone Junction, is used as a historic tourist railroad.

Southern Route

The Southern Route is approximately 211 miles long. About 5.5 percent of the route (11.6 miles) is considered to be potentially subject to high impacts. Approximately 41 miles are rated as subject to moderate impacts, and the rest of the route is projected to result in low or no identifiable impacts.

Potentially high direct impacts could result within projected sensitivity zones across the Schell Creek Range (Link 364), and high indirect impacts due to increased accessibility are also predicted in this area (Links 364 and 420). Potentially high indirect impacts due to visual intrusions is predicted at the City of Rocks archaeological district (Link 362).

Irreversible and Irretrievable Commitment of Resources

Resources committed to the proposed project would be material and nonmaterial, including financial. Irreversible commitment of resources for the purposes of this section has been interpreted to mean that those resources once committed to the proposed project would continue to be committed throughout the 40-year life of the project. Irretrievable commitment of resources has been interpreted to mean that those resources used, consumed, destroyed or degraded during construction, operation, maintenance, and abandonment of the proposed project could not be retrieved or replaced for the life of the project or beyond. Irreversible and irretrievable commitment of resources for the proposed project are summarized below in tabular form.

Resource	Type of Commitment Reason for Commitment	Irreversible	Irretrievable
Air	Degradation of air quality. Construction Activities.	No	Construction Phase
Soils	Soil loss and erosion. Construction activities.	Yes	Yes
Water	None (See Construction Materials)	----	----
Geological	None	----	----
Paleontological	Disturbance or removal of fossils. Construction activities.	----	----
Biological	Disturbance to and loss of vegetation and wildlife species. Construction and operation.	Yes	Yes
Land Use	Exclusion of residential, institutional and industrial uses.	Yes	Project life
Parks, Recreation & Preservation	Increased recreation use of preservation areas and ORV areas. Increased access for construction.	Yes	Yes

Visual	Degradation of natural scenic quality, viewshed intrusion. Construction and operation.	Yes	Project Life
Acoustical	Noise-levels exceeding ambient. Construction and operation.	Yes	Project Life
Archaeological	Disturbance or removal of sites. Construction, operation, maintenance, abandonment.	Yes	Yes
Historical	Disturbance or removal of sites; interference with visual setting. Construction, operation, maintenance, abandonment.	Yes Yes	Yes Project life
Native American	Disturbance or removal of sites. Interference with visual setting. Aural disturbance. Construction, operation, maintenance, abandonment.	Yes Yes Yes	Yes Project life Construction phase
Human Health	Potential adverse electrical effects. Operation.	Unknown	Unknown
Socioeconomic	Increased regional and local revenues. Construction and operation.	Yes	Project Life
Construction Materials & Fuels	Use of: Aggregate	Yes	Yes
	Water	Yes	Yes
	Steel	Yes	No
	Aluminum	Yes	No
	Concrete	Yes	Yes
	Wood	Yes	No
	Fossil Fuels	Yes	Yes

CHAPTER 4

Cumulative Effects

Existing Transmission Lines

There are numerous existing transmission lines, distribution lines, and other linear facilities throughout the study area. Several of the most significant features are listed below:

- 345kV Midpoint to Valmy
- 138kV Upper Salmon to Wells
- 230kV Gondor to IPP
- 230kV Gondor to Pavant
- 500kV Utah Nevada Transmission Project
- 69kV Lincoln County Cooperative
- 500kV Midpoint to Malin
- 230kV Midpoint to Boise Bench
- 500kV IPP to Adelanto (DC)
- 230kV Midpoint to Hunt
- 230kV Gondor to Machacek

Also refer to the Land Uses section in Chapter 3 and the Map Volume for further information on existing features.

BLM Utility Corridors

BLM in Nevada designates utility corridors through their Resource Management Plant (RMP) process. BLM in Idaho and Utah recognize existing utility lines as corridors. The Stateline Resource Area is currently preparing a RMP which will designate utility corridors. The RMP corridor studies and the SWIP EIS studies have been coordinated, and the preferred alternatives are similar. The Federal Lands Policy and Management Act (FLPMA) of 1976 mandates to the extent practical, BLM will consolidate future utility projects within the corridors that is established.

Future Transmission Lines

It is expected that there will be other future transmission projects constructed and operated in the same corridor as the SWIP from the Ely, Nevada area south to the Las Vegas, Nevada area. The SWIP would parallel the Utah-Nevada Transmission Project (UNTP) from the Delamar Valley south to Coyote Spring Valley. These project effects are discussed previously in this chapter. The White Pine Power Project (WPPP) and the UNTP are not dependent on the construction of the SWIP, nor is the purpose and need for the SWIP dependent on the WPPP or the UNTP.

When the White Pine Power Project (WPPP) is developed the transmission lines running south from the generating station would parallel the SWIP. Cumulative effects from the construction and operation of the two 500kV lines would be similar and generally additive to the impacts described for the SWIP. The WPPP generation station is to be constructed in the Steptoe Valley north of McGill, Nevada. The transmission system would connect the generation station with two 500kV lines through the Robinson Summit area southwest of Ely to the Las Vegas area. However, if the SWIP transmission system is constructed, it would also pass the WPPP development site (the North Steptoe substation site) to the Robinson Summit substation site. Subsequently, only one 500kV transmission line would be needed between these two points when WPPP is developed.

If the Cutoff Route is selected for the crosstie, a substation would need to be developed at North Steptoe when the crosstie route (SWIP Ely to Delta transmission system) is constructed and a second substation would be needed at Robinson Summit for the SWIP Midpoint to Dry Lake transmission line to interconnect with the 230kV system (also refer to page 2-52). If the 230kV Corridor Route is selected for the crosstie, a substation would be developed at Robinson Summit to interconnect with the 230kV system, but no substation would be needed in the North Steptoe substation until WPPP is developed in the future. Subsequently, the short-term effects to the North Steptoe substation site if the 230kV Corridor Route is selected would be somewhat less. However, the overall cumulative effects from WPPP to Robinson Summit area are expected to be about the same in the future regardless of whether the 230kV Corridor Route or the Cutoff Route is selected.

Since successive transmission line projects will be constructed in different timeframes and rehabilitation of disturbed areas will be done for each project, a similar amount of disturbed area would likely result for each. Also refer to the maps and cross-sections in the Map Volume which illustrates the foreseeable future of four 600kV transmission facilities in the same utility corridor.

When all of these projects are constructed and operating there would likely be a cumulative loss of habitats relative to the total amount of ground disturbed for small birds, insects, and mammals. Some of the ground disturbed for access roads, spur roads, marshalling yards, tower pads, etc. would be rehabilitated at the culmination of each line's construction. More of this land would naturally rehabilitate.

Where the SWIP would parallel the proposed Utah-Nevada Transmission Project (UNTP) south of the Delamar Valley, the right-of-ways of the SWIP and UNTP would need sufficient separation to meet reliability and outage criteria of the Western Systems Coordinating Council (WSCC) (also refer to page 1-2 and 2-17). Based on the terrain and environmental considerations in the area of parallel right-of-way, it is believed that 2000 feet would be adequate. Also refer to Corridor Studies (page 2-28) and Reliability (page 1-8).

The SWIP and UNTP would converge near Robber's Roost Hills (Link 675), and would travel parallel for approximately 140 miles (Links 690, 700, and 720) into Coyote Spring Valley in southern Nevada, where the UNTP would continue south and the SWIP would cross through the southern end of the Arrow Canyon Range into the Dry Lake Valley. Separation of 2000 feet is needed for this entire distance except where it is not physically possible to maintain this separation.

In the Pahranagat Wash area, the SWIP and UNTP lines may need to be closer for two miles or more. Because the Delamar Mountains and Evergreen WSAs are within about 1/2 mile of each other and other linear features are also present (e.g., U.S. Highway 93 and the Lincoln County COOP 69kV line), the SWIP and UNTP lines would be constructed on double circuit towers, each with an open circuit. The SWIP line is proposed to be on the west side and the UNTP on the east. The plan is for the two future WPPP lines to be placed on the open circuits of the SWIP and UNTP lines through this area. The proposed configuration of the planned lines through this area is shown schematically in the cross-sections included in the Map Volume. To help compensate for this lack of separation and to meet the WSCC criteria outlined above, the structures within this area would need to be engineered to a higher standard to better withstand potential physical disturbances (e.g., earthquakes, etc.). Also refer to page 2-17.

If the Delamar and Evergreen WSAs are not designated as Wilderness by Congress by the time all of the lines are constructed, the involved utilities may pursue amending the right-of-way grants to allow all of the lines to be placed on separate circuits.

In the approximately 140 miles where the SWIP and UNTP lines can be separated by 2000 feet, the SWIP and UNTP lines would form the outside edges of the utility corridor that would include the two planned 500kV WPPP transmission lines. The cross-sections in the Map Volume schematically shows the relationship of the four planned 500kV transmission facilities. Also refer to page 2-17.

Land Use Effects - Cumulative impacts to land uses are expected to be minimal. Small areas of rangeland used for grazing and forage would be permanently removed from production by tower foundations and permanent access roads. Though these impacts would accumulate with each successive project, the total area lost from production is very small in the context of the region.

Recreational uses would not be significantly affected, although off-road vehicle use could increase along some of the transmission line access roads. Wilderness areas and WSAs would not be directly affected. Indirect effects (e.g., visual impacts) to WSAs and Wilderness areas are addressed under visual resource effects.

Impacts to agricultural lands accumulate additively with each project with respect to land potentially physically removed from production. Spraying operations on agricultural lands could potentially be terminated on smaller parcels crossed by a large corridor by the addition of a single line. Soil compaction impacts are confined to the construction activities and would be largely alleviated over time through cultivation. Impacts to agricultural lands are concentrated within the state of Idaho with small portions occurring in the states of Utah and Nevada. Agricultural lands located south of Hansen, Idaho, would be crossed by Link 41 which parallels a Midpoint-Valmy 345kV transmission line. In addition, agricultural lands crossed by Link 61 and Link 62 would parallel the Midpoint-Malin 500kV and the Midpoint-Boise Bench 230kV transmission line. Link 64 parallels the Upper Salmon-Wells 138kV transmission line south of Hagerman, Idaho and would result in an increase in cumulative impacts. Agricultural lands in Utah and Nevada are crossed by Link 461 near Weaver Creek and near the Utah-Nevada state line. The proposed project would parallel the Gondor-IPP 230kV line through this area.

Impacts to military operating areas (MOAs) occur within the states of Utah and Nevada between the Hercules Gap substation site and Intermountain substation site. The proposed project would parallel the existing 230kV corridor (Gondor-IPP, Gondor-Pavant). The use of the MOAs would not have significant cumulative effects because of the shorter towers being proposed to mitigate potential conflicts with military operations.

The Marketplace Allen Transmission Project (MAT) is proposed by Nevada Power Company (NPC) to connect from the Dry Lake area northeast of Las Vegas south to a new substation in the area of the McCullough Substation. Although the MAT would be operated by NPC, several other regional utilities would likely be participants in the project. Once completed the MAT would provide a major electrical interconnection point for the inland southwest, with connection points on its north end (Dry Lake substation site) and south end (new marketplace substation near McCullough Substation). The approximately 35 mile MAT project would consist of two 500kV lines with the capacity for about 2000 megawatts each. This high capacity rating is possible because of the relatively short distance between the two proposed marketplace substations. The high capacity of this system would allow the planned transmission lines to connect on either end, while minimizing the number of lines through this sensitive area. The MAT is proposed to be in service in 1997.

There are two major potential routing alternatives for this project. The first would run straight south through the Apex development parallel to the proposed Utah-Nevada Transmission Project 500kV line, then cutting southeast to the Gypsum Wash area, then south through Sunrise Mountain and Henderson areas. The second major routing alternative would cross Interstate 15 at the north end of the Dry Lake range and run straight south paralleling the IPP-Adelanto 500kV DC line and the Navajo-McCullough 500kV line to the Sunrise Mountain and Henderson areas.

Visual Effects - Normally the first man-built objects in a natural setting cause the most noticeable change because of their contrast of form, line, color, and texture to the surroundings. However, each successive change becomes less noticeable than the first. However, the sum of all the changes (e.g., form, line, color, and texture) are more evident to the casual observer. Likewise, for transmission lines it is normally the first line in a natural area that causes the greatest incremental change. However, the cumulative visual impacts of each new line within the corridor increases with each new line. Hence, a multi-line corridor would be more visible at greater distances because of the cumulative physical contrast with the natural landscape than a single transmission line.

The proposed SWIP transmission line would increase the cumulative visual impacts to the highway views in the rural areas of Twin Falls, Idaho where Link 41 would cross Interstate 84 and parallel the Midpoint-Valmy 345kV transmission line. Visual impacts would also increase at the crossing of the U.S. Highway 30 scenic route, near the town of Hagerman, Idaho where Link 61 would parallel the Midpoint-Malin 500kV and the Midpoint-Boise Bench 230kV transmission lines west out of the Midpoint Substation. Because the landscapes of agricultural areas typically have similar structures such as center pivot and line irrigation systems, silos, barns, and distribution lines, the contrast of transmission lines is somewhat less apparent.

U.S. Highway 6/50 would be crossed by Link 460 in Sacramento Valley and Link 470 within the Swasey Mountains. Because these links would parallel the existing Gondor-IPP and Gondor-Pavant 230kV transmission lines, the cumulative visual impacts would be higher. The route would also pass within one mile of the Notch Peak and King Top WSAs.

Some cumulative visual impacts to views from local residences would occur along Link 61 near Hagerman, where the SWIP would parallel the Midpoint-Malin 500kV and the Midpoint-Boise Bench 230kV line west out of the Midpoint Substation. Residences near Eden, Idaho, would be impacted along Link 41 which would parallel the Midpoint-Valmy 345kV line from Midpoint Substation to Valmy. Occasional dispersed residences adjacent to U.S. Highway 93, near Rogerson, Idaho, and near Jackpot, Nevada, (Link 70) and Contact, Nevada, (Link 110), would also be impacted where the proposed project parallels the Upper Salmon-Wells 138kV and the Midpoint-Valmy 345kV lines. Other occurrences of impacts would include residences along Town Creek Flats and Wells, Nevada (Link 170) and Wilkins (Link 162) which would parallel the Upper Salmon-Wells 138kV line, and where the Gondor-Machacek 230kV line parallels Link 370 adjacent to Ely and Link 460, north of Hamlin Valley. Link 461 near the town of Eskdale, Utah, parallels the Gondor-Pavant and Gondor-IPP 230kV transmission lines. Links 580 and 581 near Sugarville, Utah, parallel the IPP-Adelanto 500kV DC line and the Gondor-IPP 230kV line to the Intermountain substation site.

Some cumulative visual impacts would occur to visitors of the interpretive facilities at the Minidoka Relocation Center (Link 30), where the proposed project would parallel the Midpoint-Valmy 345kV line south out of the Midpoint Substation. The SWIP routes that would cross the Salmon Falls Creek near Blue Gulch (Link 64) would parallel the Upper Salmon-Wells 138kV line. Adding the SWIP line to the existing transmission line corridor would cause some significant cumulative visual impacts.

Cumulative visual impacts would occur to views from recreation destination roads near Rogerson, Idaho, (Link 50), a road which parallels the Midpoint-Valmy 345kV line. Similar impacts would occur near Cave Lake State Recreation Area (Link 380), which parallels the Gondor-IPP and Gondor-Pavant 230kV line. Recreational viewers from the Hagerman Fossil Bed National Monument would also experience significant cumulative visual impacts where Link 61 would parallel the Midpoint-Boise Bench 230kV and the Midpoint-Malin 500kV line west of Midpoint Substation.

Links 690, 700, and 720 would parallel the proposed UNTP 500kV transmission line and the Lincoln County 69kV line through the Coyote Spring Valley. Cumulative visual impacts would likely be adverse, long term, and significant where the corridor is within one half mile of U.S. Highway 93, even though the highway is a moderate sensitivity viewpoint in this area. In addition, two WPPP 500kV lines would likely be constructed through this same area in the future. Especially at the "pinch points" where rough terrain would force the corridor to be adjacent to or across the highway, the cumulative visual impacts would be high, long term, and significant. This would be the case in Pahranagat Wash, where double circuit towers would be required (Link 690, milepost 27.5 to approximately milepost 33.0), in one area in Coyote Spring Valley (Link 720, approximately milepost 12.0), and where the four lines would cross U.S. Highway 93 near Link 690 milepost 39.5). Also refer to the maps and

cross-sections in the Map Volume which illustrate the foreseeable future of four 500kV transmission facilities in the same utility corridor.

Visual effects (indirect effects) to users of Wilderness areas and WSAs would accumulate with each successive project constructed. The cumulative visual contrast would be stronger as each new project is added, and the multiple lines would more likely attract the view of and be more noticeable to the casual observer.

Biological Effects - The cumulative biological effects would also be generally additive, and would usually be directly proportional to the amount of ground disturbed.

Impacts from other transmission line projects are expected to be similar to those identified in the technical report. The cumulative effect of several projects constructed in the same area (corridor) i.e., SWIP and UNTP, at the local level is likely to produce impacts that are of slightly higher degree (from low to moderate, for example) and possibly of longer duration. The effects depend to some extent on whether project construction activities are concurrent or overlapping in a given area. If construction is occurring concurrently a higher volume of traffic may result and possibly greater amounts of ground disturbance (erosion, etc.) would occur. Overlapping activity, on the other hand may create disturbance to wildlife for a longer period of time, resulting in prolonged or permanent displacement of wildlife from crucial habitats.

Where utility right-of-ways are adjacent to one another, the increased width of clearing would create a larger gap in the protective cover for large animals in some areas (forested habitats), and create a more visually noticeable corridor which may deter animals from crossing. In some situations the increase in vegetation diversity due to an expanded corridor can provide additional habitat for some species.

It is assumed that the effects of multiple transmission lines would "multiply" to some extent the amount of area of native habitat disturbed or lost. However, where designated corridors are used, access roads may serve more than one line and would therefore minimize ground disturbance and the amount of increased access in some areas.

In general, the effects of transmission line construction on biological resources are short-term (sage grouse are one exception). On a regional level cumulative effects for the proposed project and other related (utility) projects in the area are expected to be less than significant over the long-term. It is difficult to identify the extent of cumulative effects to wildlife resources given that some populations of animals are highly mobile and a "zone of influence" cannot be accurately defined.

There has been increasing attention given to the importance of preserving biodiversity as a management objective. According to Chadwick (1989) the primary reason so many species are threatened with extinction is that habitat is being lost and what remains is badly fragmented. There is a definite correlation between species richness and area. Large geographic areas support large numbers of species. In contrast, small isolated areas cannot hold enough members of a given species, especially large animals, to maintain a stable gene pool (Chadwick, 1989). These populations lack the genetic flexibility to cope with changes in the environment such as cycles of drought, fire, etc. and their vulnerability increases as

undesirable traits accumulate through inbreeding (Chadwick 1989). Diversity provides stability to ecosystems, whereas simplified ecosystems are subject to sudden collapse from even minor shifts in the environment.

Habitat fragmentation brought about by various kinds of development (roads, pipelines, housing developments, etc.) results in an increasing number of isolated plant and wildlife populations. Four major consequences for wildlife result from this fragmentation:

- the loss of wilderness species- those that are area sensitive and depend on large patches of habitat for the maintenance of viable populations
- loss of larger species that normally occur in low densities and move over wide areas (large carnivores)
- fragmented, human-influenced landscapes become invaded or dominated by alien or already common species adapted to interaction with human activity (pigeons, starlings, skunks, etc.)
- inbreeding depression results as a consequence of low densities and isolated populations (Harris and Gallagher, 1989).

The intrusion of roads may effectively isolate small mammal, reptile and amphibian populations. Development of roads, especially highways, reduces total amount of habitat, squeezing remaining wildlife into smaller and more isolated patches and high speed traffic eliminates more of the remaining populations (Harris and Gallagher, 1989).

Increased development and human activity in previously undisturbed habitats results in wildlife being displaced from traditional use areas. If this disturbance is temporary, significant impacts may not occur, because animals generally return once the disturbance has stopped. However, if several types of activities are occurring in an area and disturbance is prolonged, animals may be displaced to suboptimal habitats for longer periods of time (perhaps permanently). Animals forced to use areas with insufficient protective cover and insufficient quantity or quality of food, may suffer losses due to increased winter mortality, increased harvest and/or reduced reproductive effort.

Increasing numbers of powerlines, roads and development into areas of shrinking wildlife habitat is a significant issue for natural resource managers. Cooperation between federal and state agencies and private developers is critical. With an ever increasing number of consumptive uses of our natural resources it is imperative that there be coordination and cooperation between those consumers. One way impacts can be minimized is through the concentration of linear projects (transmission lines, pipelines) into designated corridors which can potentially reduce the amount of habitat fragmentation.

The following addresses potential cumulative impacts to two species of primary concern on the SWIP, desert tortoise and sage grouse.

Sage grouse - Construction of additional transmission lines would increase human activity and traffic in areas already degraded and disturbed. Continued disturbance may result in breeding failure in some areas and long-term/permanent displacement of birds from some areas. Escalating development in other areas, such as mining, would produce additional pressures on sage grouse populations, and breeding populations may become fragmented

and reduced. While small losses of sagebrush habitat are not significant, the sum of incremental losses from a variety of land management practices could produce significant declines in sage grouse numbers.

This loss of habitat cumulates with other historical land management practices which have affected loss of habitat. For example, the emphasis on cattle grazing on federal and private lands have led to chaining and controlled burning to eliminate sage brush and to encourage the growth of palatable nonwoody species. This historical practice has been largely responsible for the loss of sage grouse habitat.

Desert Tortoise - The addition of multiple transmission lines would further reduce the amount of suitable tortoise habitat and any additional access roads would increase potential for human activity in tortoise habitat. Increased vehicle traffic in these areas would result in increased mortality due to collisions with vehicles, illegal collecting, shooting, and destruction of burrows. It is unclear how much additional disturbance in tortoise habitat can be permitted without putting the Mojave tortoise population in jeopardy.

There are also concerns for raven predation of juvenile desert tortoise. Ravens, especially in and around developed areas, are known to use transmission towers as hunting perches. Although raven predation is not a serious problem in this area, there is concern that the problem may spread over time as Las Vegas continues to grow.

Potential biological effects from electric or magnetic fields from the transmission lines has received much public attention for several years. The many scientific studies on the subject show no definitive cause and effect relationship between electric or magnetic fields and possible biological effects. The utility industry and the scientific community continue studies on the subject (also refer to Electric and Magnetic Field Effects section in Chapters 3 and 4).

Other sensitive species would likely be affected by the physical loss of habitat from each successive project. Careful siting, construction sequencing, and monitoring would effectively mitigate these impacts.

Anadromous and Resident Fisheries - If the operation of the SWIP affects the operation of hydroelectric facilities, there could be beneficial, adverse or no effects to anadromous or resident fisheries. However, the SWIP could provide additional transmission capacity to accommodate system operation alternatives.

Cultural Resources Effects - The cultural resource base within the region through which the proposed transmission line runs is not very well characterized. Standards for inventory survey have evolved dramatically during the last couple of decades and only a small percentage of the region has been inventoried to current standards. For example, it is estimated that only about 3.5 percent of the Elko BLM District has been surveyed for cultural resources. Approximately 8,000 archaeological and historical sites have been inventoried and a straight line projection suggests that there may be something on the order of 200,000 unrecorded cultural resources within that district alone. The available data are quite limited, but it does seem reasonable to project that there may be half a million unrecorded cultural resources within the study region. It appears that approximately 20 to 30 percent of the

cultural resources within the region are significant resources as evaluated against criteria for listing on the National Register of Historic Places.

In general, site densities throughout the region seem to average about 2 to 6 per square mile. Linear features would encounter a disproportionately large number of sites because of a statistical "edge effect," but there are virtually no directly comparable prior linear surveys through the region to indicate how many sites might be encountered. The available data do indicate that it is not unreasonable to expect that, on the average, a cultural resource could be encountered at least every 2 to 3 miles along any of the alternative corridors. This indicates that some 200 to 400 cultural resources could be present along the selected alternative. Many of these could probably be avoided by minor adjustments in the project, but the project would undoubtedly diminish the regional resource base.

Every year more surveys are conducted within the region on federal lands or in response to federally funded or licensed projects. These are resulting in the recording of approximately several hundred resources annually. Most of these are not being damaged or destroyed, but the resource base is undoubtedly being reduced by tens if not scores of sites annually.

The proposed SWIP transmission line is not the only major development being proposed for the region. The Utah-Nevada Transmission Project (UNTP) and two additional lines within the corridor from Ely to Dry Lake (WPPP) are likely to be constructed within the next several years. None of the project areas have been intensively inventoried for cultural resources but using the parameter estimates given above, it is estimated that the impact zones for the SWIP could contain some 200 to 400 cultural resources, and some 50 to 125 of these might be considered significant. More than half and perhaps as many as 90 percent may be avoidable by minor project modifications. Thus, it is estimated that something on the order of 10 to 65 significant sites might be damaged or destroyed as a result of the construction of the SWIP. The other three proposed transmission lines are not as long as the SWIP, but if it is assumed that they would approximately triple the impacts of the SWIP, some 30 to 195 additional significant cultural resources might be damaged or destroyed. Construction of all of the projects could represent a substantial increase in the average annual rate at which cultural resources are currently being destroyed within the region, but it would be a short term increase. The aggregate loss of all or parts of approximately 40 to 260 significant sites would be a minor part of the regional resource base, which could include some 100,000 to 150,000 significant cultural resources.

Impacts to significant cultural resources would be mitigated with each project constructed or maintained. Significant resources that would be affected by construction activities would be avoided, or if this is not possible, recovered for their scientific value. The cumulative effects of all of the transmission lines being in place is not measurably different than the additive impacts of each single project, but again, the impacts of direct disturbance to sites would be mitigated.

Indirect impacts to cultural resources can result from:

- degrading the setting of a significant cultural feature

- incidental destruction of cultural sites by unwitting off-highway vehicle (OHV) recreationists

In the case of the latter, if transmission lines make formerly remote areas of the landscape more accessible (due to construction access roads), OHV users may use these roads to gain easier access to these areas. Cumulative damage to cultural sites could result over time from repeated incremental damage caused by being run over by OHVs. Illegal "pot hunting" could also increase over time due to increased accessibility into remote areas depending upon public access control by the utilities and the land managing agencies. The presence of multiple transmission lines would not likely contribute measurably to the this type of cumulative effect over a single transmission line.

Visual effects to the setting of significant cultural sites would increase with each successive transmission line, but would likely be less than additive.

Earth Resources Effects - The cumulative effects to earth resources would not be measurably different than the additive impacts of each of the incremental transmission line effects. Each transmission line would add to potential wind and water soil erosion, stream bank degradation, and sedimentation loading in water bodies, dependent on the mitigation implemented for each project.

Generally, ground disturbance and new access would be incrementally less for each successive project, which would typically add less impact from each project. However, the cumulative effects of all transmission lines would likely be greater than any single project. Indirect and off-right-of-way impacts could result from increased OHV access into remote areas. OHV travel on and off access roads could result in greater ground disturbance over time depending upon control of public access (e.g., gates, road closures, etc.) by the utilities and the land managing agencies.

Socioeconomics - Cumulative socioeconomic impacts are generally only a socioeconomic concern if they would overextend public services and accommodations in the project area. The UNTP is the only permitted project that is expected to be scheduled for construction between 1993 and 1995 within the project area. Because of the small size of the work force associated with transmission line construction, and its transitory nature, cumulative impacts are not expected to be a problem.

Air Quality - The air quality may be improved in some areas and may be degraded in others because of the development of the SWIP, depending upon the specific operation of the electrical system by SWIP participants. However, since the participants have not been determined and no federal action regarding electrical system operation in the western U.S. is required, the nature and extent of possible beneficial or adverse impacts cannot be determined.

For example, it can be surmised that if excess hydroelectric power is transferred to the southwest in the spring or summer during their peak electrical demand periods, air quality in the Northwest and the Southwest should improve if hydroelectric power is used and fossil fuel generation is reduced. Also, if fossil fuel generated power is transferred to the Northwest in the winter during peak electrical demand periods, the potentially degraded air

quality near the generation source may be offset by less emissions in other parts of the western U.S. Some fossil fuel plants in the Southwest are scheduled to be retrofitted with pollution control equipment, thereby reducing air quality concerns of potentially increasing utilization of these plants in seasonal exchanges with the Northwest. Specific operation of the SWIP, the western system in the U.S., and potential atmospheric emission of pollutants would also depend on annual weather conditions (e.g., water storage for hydroelectric generation) and the changing mix of nuclear and other generation sources (e.g., cogeneration, solar, etc.).

Future Development Projects

Energy needs throughout the western U.S. could increase over time. Several electrical generating projects of various sizes have been proposed in the past two decades, including the:

- Harry Allen Project - a proposed coal-fired generating station northeast of Las Vegas, Nevada. The Record of Decision was issued by BLM in 1980. The project has not been constructed. Nevada Power Co. has recently prepared an amendment to this original proposal. This amendment will be the subject of supplement to the Harry Allen EIS.

- White Pine Power Project - a proposed coal-fired generating station near Ely, Nevada. The Record of Decision was issued by BLM in 1985. The project has not been constructed.

- Other smaller cogeneration project currently being proposed or constructed in the Las Vegas area. Some are being pursued concurrent with preparation of this document.

- Thousand Springs Power Plant - a proposed coal-fired generating station northeast of Wells, Nevada. Following release of the DEIS in 1990 the project was discontinued.

- Various hydroelectric proposals throughout the West, many of which are being pursued concurrent with this project

- Transmission upgrades within the IPCo system and other utility systems in the western U.S. may occur to increase efficiency or transfer capabilities. This would largely depend upon the composition and percentage ownership of the potential SWIP participants (not yet determined).

- If a fiber optic groundwire is installed as part of the SWIP, it is possible in the future that capacity may be sold to a commercial communication company. If this were to occur, regeneration stations along the right-of-way would be required to carry and boost the signals similar to other fiber optic commercial carrier's facilities.

- Las Vegas Valley Water Development Project - a proposed water development project is being planned by Clark County to increase the municipal and industrial water supply of the Las Vegas area. The pipeline planned to transport the water from north of Clark County will utilize utility corridors used by the SWIP or prepare a plan amendment. The pipeline could be in the range of 36 inches in diameter

  Soils - Expected ground disturbance would be similar to the recently constructed Kern River Gas Transmission Pipeline. The disturbed area would be about 100 feet wide. Revegetation is difficult in the dry deserts of southern Nevada.

  Visual Resources - Long-term visual impacts of light colored soils and soil erosion impacts could result.

  Cultural Resources - Impacts would be similar to the Kern River Gas Transmission Pipeline. Intensive cultural surveys will be done to locate resources. Reports will be completed that will document the significance of and the mitigation for located cultural resources.

  Biological Resources - Short-term impacts and long-term impacts will be similar to those caused by the Kern River Gas Transmission Pipeline. In southern Nevada there will likely be significant concern for impacts to desert tortoise, potentially within the same corridor as the SWIP. Direct impacts to desert tortoise would be caused from their burrows being crushed or excavated during construction. Appropriate mitigation would minimize these effects. However, federal and state wildlife biologists are concerned that these linear disturbed areas may cause short-term habitat fragmentation.

Although not directly connected or related to the SWIP, these projects have been or are being proposed as alternative means of meeting current or projected electrical energy needs in various locations of the West. Of course demand for electrical energy varies with economic and demographic cycles throughout the region.

Construction and operation of any of these projects would likely result in environmental impacts to air quality, land uses (e.g., grazing) visual impacts, impacts to vegetation and wildlife, earth resources, and cultural resources. Coal-fired or cogeneration projects would cumulatively affect air quality, increasing particulate, CO_2, NO_X, and other gaseous emissions. Hydroelectric projects would likely cumulatively affect fish populations (e.g., anadromous fish) and water quality. Any new sources of generation would generally also require a new transmission system. The impacts from transmission would be similar to those for the SWIP (also refer to discussion of impacts earlier in this chapter).

The operation of the SWIP would more efficiently use existing regional generation resources. It could result in the delayed need for additional generation resources to be brought on line.

Other future potential corridor uses include fiber optic lines, and gas and water pipelines. Although the cumulative effects of a fiber optic line is minimal, a Wil-Tel fiber optic line is

presently located in Arrow Canyon. Although only in its initial planning stages, it is possible that a proposed water development project by Clark County could use one of the corridors established by the SWIP in east-central and southern Nevada for its water transport system.

Global Warming

The operation of the SWIP itself is not expected to contribute to global warming or the buildup of CO_2 in the atmosphere. However, because operating the SWIP implies operating parts of the electrical system in the western U.S., the SWIP may contribute positively or negatively to the buildup of CO_2 from the burning of fossil fuels depending upon how the system is operated on a day to day, seasonal, or long-term basis. However, since the participants have not been determined and no federal action (e.g., EIS) regarding electrical system operation in the western U.S. is required, the nature and extent of possible beneficial or adverse impacts cannot be determined.

CHAPTER 4

TABLES

TABLE 4-1

Generic Mitigation Measures Included In The Project Description

1. All construction vehicle movement outside the right-of-way would normally be restricted to predesignated access, contractor acquired access or public roads.

2. The areal limits of construction activities would normally be predetermined, with activity restricted to and confined within those limits. No paint or permanent discoloring agents would be applied to rocks or vegetation to indicate survey or construction activity limits.

3. In construction areas where recontouring is not required, vegetation would be left in place wherever possible and original contour would be maintained to avoid excessive root damage and allow for resprouting.

4. In construction areas (e.g., marshalling yards, tower sites, spur roads from existing access roads) where ground disturbance is significant or where recontouring is required, surface restoration would occur as required by the landowner or land management agency. The method of restoration would normally consist of returning disturbed areas back to their natural contour, reseeding (if required), cross drains installed for erosion control, placing water bars in the road, and filling ditches.

5. Watering facilities (e.g. - tanks, developed springs, water lines, wells, etc.) would be repaired or replaced if they are damaged or destroyed by construction activities to their predisturbed condition as required by the landowner or land management agency.

6. Towers and/or ground wire would be marked with high-visibility devices where required by governmental agencies (Federal Aviation Administration).

7. On agricultural land, right-of-way would be aligned, in so far as practical, to reduce the impact to farm operations and agricultural production.

8. Prior to construction, all supervisory construction personnel would be instructed on the protection of cultural and ecological resources. To assist in this effort, the construction contract would address: (a) Federal and state laws regarding antiquities and plants and wildlife, including collection and removal; (b) the importance of these resources and the purpose and necessity of protecting them.

9. Cultural resources would continue to be considered during post-EIS phases of project implementation in accordance with the programmatic agreement that would be developed in conjunction with preparation of the EIS. This would involve intensive surveys to inventory and evaluate cultural resources within the selected corridor and any appurtenant impact zones beyond the corridor, such as access roads and construction

TABLE 4-1

Generic Mitigation Measures Included In The Project Description

equipment yards. In consultation with appropriate land managing agencies and state historic preservation officers, specific mitigation measures would be developed and implemented to mitigate any identified adverse impacts. These may include project modifications to avoid adverse impacts, monitoring of construction activities, and data recovery studies.

10. The Project Sponsors would respond to complaints of line-generated radio or television interference by investigating the complaints and implementing appropriate mitigation measures. The transmission line would be patrolled on a regular basis so that damaged insulators or other line materials that could cause interference are repaired or replaced.

11. The Project Sponsors would apply necessary mitigation to eliminate problems of induced currents and voltages onto conductive objects sharing a right-of-way, to the mutual satisfaction of the parties involved.

12. The Project Sponsors would continue to monitor studies performed to determine the effects of audible noise and electrostatic and electromagnetic fields in order to ascertain whether these effects are significant.

13. Roads would be built as near as possible at right angles to the streams and washes. Culverts would be installed where necessary. All construction and maintenance activities shall be conducted in a manner that would minimize disturbance to vegetation, drainage channels, and intermittent or perennial streambanks. In addition, road construction would include dust-control measures during construction in sensitive areas. All existing roads would be left in a condition equal to or better than their condition prior to the construction of the transmission line.

14. All requirements of those entities having jurisdiction over air quality matters would be adhered to and any necessary permits for construction activities would be obtained. Open burning of construction trash would not be allowed unless permitted by appropriate authorities.

15. Fences and gates would be repaired or replaced to their original predisturbed condition as required by the landowner or the land management agency if they are damaged or destroyed by construction activities. Temporary gates would be installed only with the permission of the landowner or the land management agency; and would be restored to its original predisturbed condition following construction.

16. Transmission line materials would be designed and tested to minimize corona. A bundle configuration (three conductors per phase except for the Ely to Delta segment would be two conductors per phase) and larger diameter conductors would be used to limit the audible noise, radio interference (RI), and television interference (TVI) due to corona. Tension would be maintained on all insulator assemblies to assure positive contact

Table 4.1 (Continued)
Outside Mitigation Measures Included in the Project Description

cultivated lands. In consultation with appropriate land [illegible] and [illegible] habitat preservation entities, specific mitigation measures would be [illegible] and implemented to mitigate any identified adverse impacts. These may include project modifications to avoid adverse impacts, monitoring of construction activities, and [illegible] recovery studies.

10. The Project Sponsors would respond to complaints of [illegible] by investigating the complaints and [illegible] measures. The transmission line would be [illegible] as a result [illegible] locations or other [illegible] facilities other [illegible].

11. The Project Sponsors would apply necessary [illegible] consultation with [illegible] respective [illegible] including [illegible] of the parties involved.

12. The Project Sponsors would [illegible] affected [illegible] with [illegible] these [illegible] agencies.

13. [illegible] at [illegible] Caltrans [illegible] be [illegible] shall be [illegible] that [illegible] and [illegible] and [illegible] of the [illegible] line.

14. All [illegible] of these [illegible] permits [illegible] Corps [illegible] would [illegible] appropriate [illegible].

15. [illegible] would be [illegible] or [illegible] as employed [illegible] of [illegible] of the [illegible] and [illegible] groundwater [illegible] following [illegible].

16. [illegible] would be [illegible] of [illegible] these [illegible] the [illegible] would be [illegible].

between insulators, thereby avoiding sparking. Caution would be exercised during construction to avoid scratching or nicking the conductor surface which may provide points for corona to occur.

17. During operation of the transmission line, the right-of-way would be maintained free of non-biodegradable debris.

18. The primary focus of paleontological mitigation efforts should be areas of greatest disturbance and areas likely to have significant fossils.

19. Mitigation measures that will be developed during the consultation period under Section 7 of the Endangered Species Act (1974) will be adhered to as specified in the Biological Opinion of the USDI Fish and Wildlife Service.

20. Hazardous materials shall not be drained onto the ground or into streams or drainage areas. Totally enclosed containment shall be provided for all trash. All construction waste including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials shall be removed to a disposal facility authorized to accept such materials.

Table 4-1 (continued)
General Mitigation Measures Included in the Project Description

between mudding, nearby breeding structures. Caution should be exercised during construction to avoid disturbing or [illegible] sections which may provide potential [illegible] occur.

17. During operation of the transmission line, the right-of-way should be kept free of most flammable debris.

18. The primary focus of paleontological mitigation efforts should be on areas of disturbance that are likely to have significant finds.

19. Mitigation measures that will be developed during the consultation process of the Endangered Species Act (1973) will be adhered to [illegible] Opinion of the United States Fish and Wildlife Service.

20. Hazardous materials shall not be drained onto the ground or [illegible] areas. Totally enclosed containment shall be provided for all [illegible] waste including trash and litter, garbage, other solid waste [illegible] other potentially hazardous materials shall be removed to a [illegible] disposal facility.

TABLE 4-2

Selectively Committed Mitigation Measures

Note: These selective mitigation measures apply only to specific impact locations that were identified in the EIS or during field investigations.

1. No widening or upgrading of existing access roads would be undertaken in the area of construction and operation, except for repairs necessary to make roads passable, where soils and vegetation are very sensitive to disturbance.

2. There would be no blading of new access roads in the area of construction and operation. Existing crossings would be utilized at perennial streams, National Recreational Trails, and irrigation channels. Off-road or cross-country access routes would be used for construction and maintenance. This would minimize ground disturbance impacts. These access routes must be flagged with an easily seen marker and the route must be approved in advance of use by the authorized officer.

3. The alignment of any new access roads or overland route would follow the designated area's landform contours where possible, providing that such alignment does not additionally impact resource values. This would minimize ground disturbance and/or reduce scarring (visual contrast).

4. All new access roads not required for maintenance would be permanently closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager (e.g., stock piling and replacing topsoil, or rock replacement). This would limit new or improved accessibility into the area.

5. Modified tower design or alternate tower type would be utilized to minimize ground disturbance, operational conflicts, visual contrast and/or avian conflicts.

6. In designated areas, structures would be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. This would minimize amount of sensitive feature disturbed and/or reduce visual contrast.

7. Standard tower design would be modified to correspond with spacing of existing transmission line structures where feasible and within limits of standard tower design. The normal span would be modified to correspond with existing towers, but not necessarily at every location. This would reduce visual contrast and/or potential operational conflicts.

8. At highway, canyon, and trail crossings, towers are to be placed at the maximum feasible distance from the crossing, to reduce visual impacts.

TABLE 4-3

Selectively Committed Mitigation Measures

[illegible]

Table 4-2 (continued)
Selectively Recommended Mitigation Measures

9. Nonspecular conductors would be used, where specified by the authorized officer, to reduce visual impacts.

10. "Dulled" metal finish towers would be used to reduce visual impacts.

11. With the exception of emergency repair situations, right-of-way construction, restoration, maintenance, and termination activities in designated areas would be modified or discontinued during sensitive periods (e.g., nesting and breeding periods) for candidate, proposed threatened and endangered, or other sensitive animal species. Sensitive periods, species affected, and areas of concern would be approved in advance of construction or maintenance by the authorized officer.

12. Helicopter placement of towers would be used to reduce ground disturbance impacts (e.g., soil erosion).

Table 4.2 (continued)
Selectively Recommended Mitigation Measures

8. If temporary construction roads are needed for access, all areas disturbed by the [illegible] should be [illegible] native plant [illegible].

9. [illegible] used [illegible] should [illegible] to [illegible] native [illegible].

10. With the exception of [illegible] equipment [illegible], [illegible] [illegible], and [illegible] to [illegible] areas [illegible] [illegible] [illegible] [illegible], [illegible] [illegible] [illegible], [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible], species [illegible] [illegible] of [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible].

11. [illegible] [illegible] [illegible] should [illegible] [illegible] [illegible] [illegible] [illegible].

TABLE 4-3

Range Allotments Crossed By Alternative Routes - Midpoint to Dry Lake

ALLOTMENT NAME	TOTAL ACRES	ROUTE A TOTAL ACRES	ROUTE A VIABLE ACRES	ROUTE B TOTAL ACRES	ROUTE B VIABLE ACRES	ROUTE C TOTAL ACRES	ROUTE C VIABLE ACRES	ROUTE D TOTAL ACRES	ROUTE D VIABLE ACRES	ROUTE E TOTAL ACRES	ROUTE E VIABLE ACRES	ROUTE F TOTAL ACRES	ROUTE F VIABLE ACRES	ROUTE G TOTAL ACRES	ROUTE G VIABLE ACRES
AMSTERDAM KUNKEL	1,100	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
ANTELOPE VALLEY	45,458	-----	-----	6.6	6.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
ARROW CANYON	88,448	17.3	9.2	17.3	9.2	17.3	9.2	17.3	9.2	17.3	9.2	17.3	9.2	17.3	9.2
ARTESIAN KIDD	6,160	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	-----	-----	1.3	1.3
BADGER SPRING	24,125	39.7	26.7	39.7	26.7	39.7	26.7	39.7	26.7	39.7	26.7	39.7	26.7	39.7	26.7
BECKY CREEK	13,104	2.2	0.1	2.2	0.1	2.2	0.1	-----	-----	2.2	0.1	2.2	0.1	-----	-----
BECKY SPRING	40,621	18.4	13.9	25.0	18.4	18.4	13.9	-----	-----	25.0	18.4	18.4	13.9	-----	-----
BIG CREEK ISO	320	13.3	6.3	13.3	6.3	13.3	6.3	13.3	6.3	13.3	6.3	-----	-----	13.3	6.3
BIG SPRINGS	482,616	72.7	45.7	54.8	23.8	72.7	45.7	-----	-----	54.6	23.8	72.7	45.7	72.7	45.7
BISHOP FLAT	4,631	-----	-----	-----	-----	-----	-----	4.1	4.1	-----	-----	-----	-----	-----	-----
BOONE SPRING	79,733	-----	-----	25.8	17.7	-----	-----	-----	-----	25.8	17.7	-----	-----	-----	-----
BUCKHORN	82,968	20.8	8.8	20.8	8.8	26.8	8.8	20.8	8.8	20.8	8.8	20.8	8.8	20.8	8.8
CAMP 1	12,188	2.7	2.3	2.7	2.3	2.7	2.3	2.7	2.3	2.7	2.3	1.9	1.3	2.7	2.3
CHERRY CREEK	153,107	43.1	24.9	44.4	24.6	43.1	24.9	54.9	39.2	43.1	24.9	43.1	24.9	56.2	38.9
CLIFF SPRING	35,821	9.5	9.1	9.5	9.1	9.5	9.1	9.5	9.1	9.5	9.1	9.5	9.1	9.5	9.1
COVE	26,538	18.4	17.5	18.4	17.5	18.4	17.5	18.4	17.5	18.4	17.5	18.4	17.5	18.4	17.5
DELAMAR	240,755	19.2	11.0	19.2	11.0	19.2	11.0	19.2	11.0	19.2	11.0	19.2	11.0	19.2	11.0
DOUGLAS CANYON	12,222	13.1	10.9	13.1	10.9	13.1	10.9	13.1	10.9	13.1	10.9	13.1	10.9	13.1	10.9
DRY LAKE	69,339	12.6	9.8	12.6	9.8	12.6	9.8	12.6	9.8	12.6	9.8	12.6	9.8	12.6	9.8
DUCK CREEK FLAT	33,805	4.9	1.6	-----	-----	4.9	1.6	4.9	1.6	4.9	1.6	4.9	1.6	-----	-----
ELY SPRINGS AMP	56,128	26.8	21.9	26.8	21.9	26.8	21.9	26.8	21.9	26.8	21.9	26.8	21.9	26.8	21.9
FOREST MOON	99,968	20.6	8.9	20.6	8.9	20.6	8.9	20.6	8.9	20.6	8.9	20.6	8.9	20.6	8.9
FOX MOUNTAIN	75,436	30.0	16.8	30.0	16.8	30.0	16.8	30.0	16.8	30.0	16.8	30.0	16.8	30.0	16.8
GIROUX WASH	48,200	42.0	22.9	42.0	22.9	42.0	22.9	42.0	22.9	42.0	22.9	42.0	22.9	42.0	22.9
GOLD CANYON	23,640	11.9	3.7	-----	-----	11.9	3.7	11.9	3.7	11.9	3.7	11.9	3.7	-----	-----
GOODTIME	16,766	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.1	0.0	-----	-----
HARDY SPRINGS	108,331	25.5	15.1	25.5	15.1	25.5	15.1	25.5	15.1	25.5	15.1	25.5	15.1	25.5	15.1

Table 4-3 (continued)
Range Allotments Crossed By Alternative Routes - Midpoint to Dry Lake

ALLOTMENT NAME	TOTAL ACRES	ROUTE A TOTAL ACRES	ROUTE A VIABLE ACRES	ROUTE B TOTAL ACRES	ROUTE B VIABLE ACRES	ROUTE C TOTAL ACRES	ROUTE C VIABLE ACRES	ROUTE D TOTAL ACRES	ROUTE D VIABLE ACRES	ROUTE E TOTAL ACRES	ROUTE E VIABLE ACRES	ROUTE F TOTAL ACRES	ROUTE F VIABLE ACRES	ROUTE G TOTAL ACRES	ROUTE G VIABLE ACRES
HD	380,659	99.7	58.0	86.8	58.9	86.8	58.9	46.4	21.0	75.7	39.0	86.8	58.9	73.2	30.7
HOLBORN	49,196	-----	-----	-----	-----	-----	-----	16.1	14.4	-----	-----	-----	-----	-----	-----
INDIAN JAKE	57,542	11.7	11.2	11.7	11.2	11.7	11.2	11.7	11.2	11.7	11.2	11.7	11.2	11.7	11.2
JACKPOT	70,137	25.6	18.6	13.6	13.0	13.6	13.0	25.6	18.6	25.6	18.6	16.2	14.9	21.1	13.6
JONES GOAT SPRINGS	1,431	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.4	2.4
KERR - BERGER	2,229	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	3.4	1.1	-----	-----
KERR - LOST CREEK	15,308	0.5	0.0	0.5	0.0	0.5	0.0	0.5	0.0	0.5	0.0	-----	-----	-----	-----
KUNKEL - BERGER	1,516	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.7	0.2	-----	-----
LEAD HILLS	80,797	-----	-----	28.5	26.7	-----	-----	-----	-----	28.5	26.7	-----	-----	-----	-----
LEHMANN & PETERSON	21,353	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	7.9	4.7	-----	-----
LEPPY HILLS	72,995	-----	-----	16.0	14.0	-----	-----	-----	-----	16.0	14.0	-----	-----	-----	-----
LOST CREEK - U2	4,173	3.4	2.4	3.4	2.4	3.4	2.4	3.4	2.4	3.4	2.4	-----	-----	3.4	2.4
LOWER LAKE	107,317	18.1	9.2	18.1	9.2	18.1	9.2	18.1	9.2	18.1	9.2	18.1	9.2	18.1	9.2
McQUEEN FLAT	10,403	3.6	3.2	3.6	3.2	3.6	3.2	3.6	3.2	3.6	3.2	3.6	3.2	3.6	3.2
MEDICINE BUTTE	294,355	4.6	4.6	7.4	4.7	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	7.4	4.7
MIDDLE STEPTOE	2,361	4.4	2.2	-----	-----	4.4	2.2	4.4	2.2	4.4	2.2	4.4	2.2	-----	-----
MILNER PLOT	2,530	3.2	0.0	3.2	0.0	3.2	0.0	3.2	0.0	3.2	0.0	-----	-----	3.2	-----
MOOR SUMMITT	18,323	-----	-----	-----	-----	-----	-----	12.3	6.6	-----	-----	-----	-----	-----	-----
NORTH COVE	25,446	9.4	9.2	9.4	9.2	9.4	9.2	9.4	9.2	9.4	9.2	9.4	9.2	9.4	9.2
NORTH MILNER	28,184	14.5	5.0	14.5	5.0	14.5	5.0	14.5	5.0	14.5	5.0	-----	-----	14.5	5.0
OAK SPRINGS AMP	195,049	19.2	18.8	19.2	18.8	19.2	18.8	19.2	18.8	19.2	18.8	19.2	18.8	19.2	18.8
PILOT	143,082	-----	-----	28.0	18.7	-----	-----	-----	-----	28.0	18.7	-----	-----	-----	-----
PITTMAN WELL	39,595	13.8	5.1	13.8	5.1	13.8	5.1	13.8	5.1	13.8	5.1	13.8	5.1	13.8	5.1
POINT RANCH	36,179	30.6	27.3	30.6	27.3	30.6	27.3	30.6	27.3	30.6	27.3	26.8	23.5	30.6	27.3
POLELINE	4,889	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.6	2.6	-----	-----
RIDGE ISOLATED	8,705	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	-----	-----	5.3	5.3
SALMON RIVER	311,575	63.1	39.7	64.8	49.1	64.8	49.1	63.1	39.7	63.1	39.7	64.8	49.1	65.7	34.6
SAND BUTTE	6,488	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.5	2.5	-----	-----
SCHNELL SALMON TRACT	14,138	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	-----	-----	8.1	8.1

Table 4-3 (continued)
Range Allotments Crossed By Alternative Routes - Midpoint to Dry Lake

ALLOTMENT NAME	TOTAL ACRES	ROUTE A TOTAL ACRES	ROUTE A VIABLE ACRES	ROUTE B TOTAL ACRES	ROUTE B VIABLE ACRES	ROUTE C TOTAL ACRES	ROUTE C VIABLE ACRES	ROUTE D TOTAL ACRES	ROUTE D VIABLE ACRES	ROUTE E TOTAL ACRES	ROUTE E VIABLE ACRES	ROUTE F TOTAL ACRES	ROUTE F VIABLE ACRES	ROUTE G TOTAL ACRES	ROUTE G VIABLE ACRES
SEVEN MILE	2,182	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.7	2.0	-----	-----
SHOESTRING CATTLE	2,523	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	9.4	6.0	-----	-----
SIMPSON	8,379	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
SOUTH BUTTE	28,776	12.1	8.4	-----	-----	12.1	8.4	12.1	8.4	12.1	8.4	12.1	8.4	-----	-----
SPRUCE	813,267	72.9	43.5	-----	-----	72.9	43.5	80.4	45.4	-----	-----	72.9	43.5	55.0	40
SQUAW JOE	8,702	11.5	10.6	11.5	10.6	11.5	10.6	11.5	10.6	11.5	10.6	-----	-----	11.5	10.6
SQUAW JOE ISO	56,904	5.7	4.6	5.7	4.6	5.7	4.6	5.7	4.6	5.7	4.6	-----	-----	5.7	4.6
STEPTOE	46,532	15.8	9.1	-----	-----	15.8	9.1	15.8	9.1	15.8	9.1	15.8	9.1	-----	-----
SUNNYSIDE	219,519	10.9	7.8	10.9	7.8	10.9	7.8	10.9	7.8	10.9	7.8	10.9	7.8	10.9	7.8
TELGRPH CR. MED. BTE.	287,368	-----	-----	20.9	20.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
THIRTY MILE SPRING	178,716	33.6	30.3	49.2	42.2	33.6	30.3	33.6	30.3	33.6	30.3	33.6	30.3	49.2	42.2
TOM PLAIN	74,020	19.6	9.9	19.6	9.9	19.6	9.9	19.6	9.9	19.6	9.9	19.6	9.9	19.6	9.9
TOWN CREEK	11,446	-----	-----	-----	-----	-----	-----	14.9	14.2	-----	-----	-----	-----	-----	-----
UTAH - NEV #1	120,617	-----	-----	27.8	16.5	-----	-----	-----	-----	27.8	16.5	-----	-----	-----	-----
WENDELL CATTLE	10,441	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	7.2	3.6	-----	-----
WEST WHITE HORSE	7,208	-----	-----	6.5	5.4	-----	-----	-----	-----	6.5	5.4	-----	-----	-----	-----
WESTERN STOCKGRWERS	25,053	20.7	14.5	20.7	14.5	20.7	14.5	20.7	14.5	20.7	14.5	-----	-----	20.7	14.5
WHISKEY CREEK	19,393	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	20.4	6.8	-----	-----
WHISKEY CREEK ISO	19,393	2.3	2.1	2.3	2.1	2.3	2.1	2.3	2.1	2.3	2.1	-----	-----	2.3	2.1
WHITE HORSE	61,571	26.2	21.5	32.7	18.3	26.2	21.5	33.4	17.0	32.7	18.3	26.2	21.5	33.4	17.0
WILSON CREEK	1,077,994	54.1	46.1	54.1	46.1	54.1	46.1	54.1	46.1	54.1	46.1	54.1	46.1	54.1	46.1
WOOD HILLS	71,457	-----	-----	-----	-----	-----	-----	44.6	33.4	-----	-----	-----	-----	-----	-----
GRAND TOTAL	7,038,944	1098.1	732.6	1127.9	786.2	1080.9	737.3	1070.0	720.3	1128.8	748.5	1042.0	703.7	1022.7	676.6

TABLE 4-3A

Range Allotments Crossed by Alternative Routes - Ely to Delta

		DELTA DIRECT		CUTOFF		230kV CORRIDOR		SOUTHERN	
ALLOTMENT NAME	TOTAL ACRES	TOTAL ACRES	VIABLE ACRES	TOTAL ACRES	VIABLE ACRES	TOTAL ACRES	VIABLE ACRES	TOTAL ACRES	VIABLE ACRES
ANTELOPE	79213	-----	-----	10.20	10.10	10.20	10.10	-----	-----
BADGER SPRING	24125	-----	-----	-----	-----	-----	-----	39.70	26.70
BAKER CREEK	55515	-----	-----	-----	-----	6.30	6.30	-----	-----
BASTIAN CREEK	13527	-----	-----	-----	-----	5.70	4.50	-----	-----
BECKY CREEK	13104	14.40	10.30	14.40	10.30	-----	-----	-----	-----
BLACK HAM	33828	-----	-----	-----	-----	-----	-----	18.20	17.80
BLIND VALLEY	45856	-----	-----	-----	-----	-----	-----	13.30	11.60
BRECKS KNOLL	81495	-----	-----	-----	-----	-----	-----	17.00	14.90
BUCK SKIN	24270	-----	-----	18.00	17.50	-----	-----	-----	-----
CATTLE CAMP - CAVE VALLEY	76816	-----	-----	-----	-----	-----	-----	30.50	27.30
CHALK KNOLL	51738	-----	-----	-----	-----	-----	-----	1.30	0.10
CHERRY CREEK	153107	3.50	0.00	3.50	0.00	-----	-----	-----	-----
COPPER FLAT	40058	-----	-----	-----	-----	17.60	6.10	-----	-----
DARK PEAK	20223	-----	-----	-----	-----	-----	-----	6.10	3.20
DEADMANS WASH	58435	-----	-----	-----	-----	-----	-----	25.40	24.80
DEATH CANYON	31229	-----	-----	16.40	6.10	40.60	24.20	-----	-----
DESERET	324749	-----	-----	14.00	7.30	-----	-----	42.30	19.70
DEVILS GATE	17686	-----	-----	28.00	25.50	-----	-----	-----	-----
GARRISON	50954	-----	-----	-----	-----	1.60	1.30	-----	-----
GEORGE TOWN RANCH	23688	-----	-----	-----	-----	20.50	16.20	-----	-----
GIROUX WASH	48200	-----	-----	-----	-----	-----	-----	19.20	9.90
GRANITE	55704	-----	-----	19.20	11.80	19.20	11.80	-----	-----
HAMBLIN SPRING	105831	-----	-----	-----	-----	-----	-----	22.20	19.70
HEUSSER MOUNTAIN	33956	-----	-----	-----	-----	6.70	5.80	-----	-----
INDIAN GEORGE	41650	19.80	18.00	9.60	8.20	-----	-----	-----	-----
INDIAN JAKE	57542	-----	-----	-----	-----	-----	-----	11.70	11.20
KLONDIKE	36223	-----	-----	-----	-----	-----	-----	15.10	12.30
KNOLL SPRINGS	38409	-----	-----	7.80	3.00	6.00	3.20	-----	-----

Table 4-3A (continued)
Range Allotments Crossed by Alternative Routes - Ely to Delta

		DELTA DIRECT		CUTOFF		230kV CORRIDOR		SOUTHERN	
ALLOTMENT NAME	TOTAL ACRES	TOTAL ACRES	VIABLE ACRES	TOTAL ACRES	VIABLE ACRES	TOTAL ACRES	VIABLE ACRES	TOTAL ACRES	VIABLE ACRES
LADY LAIRD	60022	21.90	13.50	10.10	4.60	10.10	4.60	10.10	4.60
LAKE AREA	29836	-----	-----	-----	-----	-----	-----	9.70	9.70
LITTLE DRUM	76382	26.30	23.30	21.80	15.10	21.80	15.10	22.40	15.60
MAJORS	104861	-----	-----	-----	-----	20.10	13.50	-----	-----
McCLINTOCK	3480	1.30	1.20	1.30	1.20	1.30	1.20	1.30	1.20
MORMAN GAP	53101	-----	-----	-----	-----	-----	-----	20.10	20.10
MUNCY CREEK AMP	207906	26.00	18.70	8.60	0.90	-----	-----	-----	-----
NORTH CANYON	21264	-----	-----	12.30	1.90	-----	-----	-----	-----
PAINTED POTHOLES	42663	-----	-----	-----	-----	-----	-----	28.70	26.30
PAINTER SPRINGS	38003	-----	-----	29.60	18.00	29.60	18.00	-----	-----
PARTOUN	92186	26.40	24.10	-----	-----	-----	-----	-----	-----
RED HILLS	35489	23.90	10.40	-----	-----	-----	-----	-----	-----
SACRAMENTO PASS	21843	-----	-----	-----	-----	11.90	7.10	-----	-----
SAND PASS	32229	20.90	13.10	-----	-----	-----	-----	-----	-----
SKULL ROCK	57171	-----	-----	-----	-----	-----	-----	18.00	17.30
SMELTER MOUNTAIN	74048	21.20	10.60	21.20	10.60	21.20	10.60	21.20	10.60
SMITH CREEK	17820	-----	-----	40.60	27.90	43.00	38.60	-----	-----
SMITH CREEK AMP	68072	-----	-----	8.50	8.30	15.70	12.20	-----	-----
SOUTH SPRINGS VALLEY	83723	-----	-----	-----	-----	-----	-----	29.70	23.90
STATE LINE	36538	-----	-----	-----	-----	-----	-----	15.60	15.20
STRAWBERRY	21625	-----	-----	-----	-----	9.40	7.50	-----	-----
SWASEY KNOLL	53709	30.10	19.20	-----	-----	-----	-----	-----	-----
TATOW	65407	-----	-----	5.00	3.10	5.00	3.10	-----	-----
THIRTY MILE SPRING	178716	-----	-----	-----	-----	23.70	23.70	10.40	10.40
THOUSAND PEAKS	375439	63.60	23.60	-----	-----	-----	-----	-----	-----
TIPPETT	200041	26.90	20.40	-----	-----	-----	-----	-----	-----
TIPPETT PASS	77161	28.60	23.70	-----	-----	-----	-----	-----	-----
WHITE ROCK	83547	-----	-----	-----	-----	-----	-----	61.70	50.00
WILLOW SPRINGS	602	-----	-----	-----	-----	-----	-----	29.30	24.60
GRAND TOTALS	3850015	354.8	230.1	300.1	191.4	347.2	244.7	540.2	428.7

TABLE 4-4

Estimated County Tax Revenues[1] by Alternative Route

State/ County	Midpoint to Dry Lake Alternative Routes						
	Route A	Route B	Route C	Route D	Route E	Route F	Route G
IDAHO							
Cassia	20,800	20,800	20,800	20,800	20,800	-----	20,800
Gooding	-----	-----	-----	-----	-----	211,500	-----
Jerome	455,700	455,700	455,700	455,700	455,700	144,100	455,700
Twin Falls	570,700	570,700	570,700	570,700	570,700	916,600	570,700
NEVADA							
Elko	759,200	769,100	727,100	767,600	801,200	727,100	729,200
White Pine	582,000	588,300	582,000	576,200	596,100	582,000	568,400
Lincoln	539,400	539,400	539,400	539,400	539,400	539,400	539,400
Nye	261,800	261,800	261,800	261,800	261,800	261,800	261,800
Clark	150,800	150,800	150,800	150,800	150,800	150,800	150,800

State/ County	Ely to Delta Alternative Routes			
	Direct	Cutoff	230kV Corridor	Southern
UTAH				
Millard	355,200	846,000	853,700	998,700
Juab	296,100	-----	-----	-----
NEVADA				
White Pine	255,700	289,200	320,500	494,900

Estimates are based on average 1990 property tax rates in each county and an average cost for the transmission lines and associated communication and substation facilities. Figures are rounded to the nearest hundred. Estimates represent revenues during the first year of operation without depreciation.

TABLE 4-5

Electric Field Calculations

Calculated electric fields for the proposed Southwest Intertie Project 500kV line operated at maximum voltage. Minimum clearance associated with a conductor temperature of 120° F (49° C) has been used. Calculated fields are reported as the maximum level on the right-of-way (PEAK) and at the edge of the right-of-way (ROW).

		Electric Field, kV/m					
		Existing Corridor			Proposed Corridor		
Case	Figure	ROW Width, ft.	Peak	ROW	ROW Width, ft.	Peak	ROW
9	1				200	8.4	1.9
1	A1	60	1.9	1.4	260	8.4	1.6, 1.9
2	A2	150	6.2	0.9, 1.3	350	8.4	0.9, 2.0
3	A3	150	6.2	0.9, 1.3,	350	8.4	0.9, 2.0
4	A3	140	6.9	1.4	340	8.4	1.0, 1.9
5	A5	200	7.0	1.4, 1.4	400	8.4	1.5, 1.9
6	A6	200	7.1	1.5, 1.9	400	8.4	1.5, 1.9
7	A7	285	7.7	1.3, 2.3	485	8.4	1.3, 2.0
8	A8	175	7.7	2.3	375	8.4	2.3, 2.0
9	A9	120	2.5	1.0	325	8.4	0.8, 1.9
10	A10	280	4.2	1.0, 1.3	480	8.4	1.0, 1.9
11	A14	230	4.2	1.0, 1.3	430	8.4	1.1, 1.9
12	A12	150	DC	DC	350	8.4	1.9
14	A13	260	2.2	1.3, .04	460	8.4	1.3, 1.9
14	A14	110	2.2	1.3, 1.3	310	8.4	1.4, 1.9
15	A15	120	4.2	1.0	320	8.4	1.1, 1.9
16	A16	100	0.8	0.2	300	8.4	0.4, 1.9
17	double-circuit configuration would result in field equal or less than the values shown for Case 8						

CHAPTER 4

TABLE 4-6

Magnetic Field Calculations

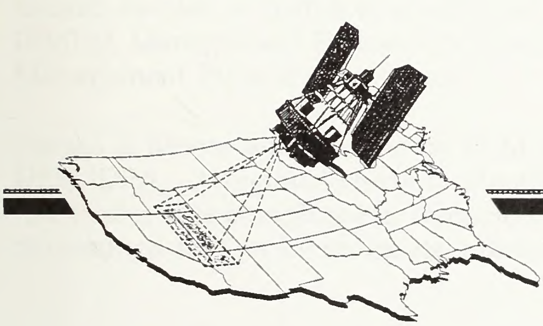
Calculated magnetic fields in milligauss (mG) for the proposed Southwest Intertie Project 500kV line. A minimum clearance associated with a conductor temperature of 120° F (49° C) and the maximum continuous current at the proposed line have been used. Calculated fields are reported as the maximum level on the right-of-way (PEAK) and at the edge of the right-of-way (ROW). Calculated values for both average current and maximum continuous current are given. Fields for maximum current conditions are given in brackets [ ].

		Magnetic Field, mG					
		Existing Corridor			Proposed Corridor		
Case	Figure	ROW Width, ft.	Peak	ROW	ROW Width, ft.	Peak	ROW
6	1	—	—	—	200	117 [234]	27 [55]
1	A4	60	44 [89]	21 [42]	260	118 [237]	29, 28 [59, 55]
2	A2	150	44 [100]	11, 15 [34]	350	118 [237]	15, 28 [43, 56]
3	A3	150	44 [100]	11, 15 [34]	350	118 [237]	15, 28 [43, 56]
4	A4	140	66 [136]	14 [29]	340	115 [230]	19, 28 [38, 56]
5	A5	150	64 [132]	24, 15 [47, 31]	320	115 [230]	26, 28 [51, 56]
6	A6	205	67 [137]	25, 19 [50, 39]	400	115 [229]	27, 29 [54, 57]
2	A7	285	137 [274]	19, 37 [44, 75]	340	131* [262]*	20, 31 [48, 61]
3	A8	175	139 [277]	37 [74]	375	133* [267]*	40, 31 [80, 61]
3	A6	125	** [175]	** [47]	325	113 [229]	26, 30 [56, 57]
10	A10	280	246 [301]	54, 6 [66, 12]	480	244* [297]*	55, 28 [70, 56]
11	A11	230	246 [301]	54, 9 [67, 15]	340	243 [296]	56, 29 [71, 56]
12	A10	150	—	—	350	117 [234]	4, 27 [9, 55]
13	A13	285	7 [21]	3, 0 [9, 1]	460	117 [233]	4, 27 [12, 55]
14	A14	110	7 [121]	3 [9]	310	117 [233]	8, 27 [20, 55]
15	A15	120	247 [302]	54 [66]	320	240* [290]*	59, 30 [76, 58]
16	A16	100	26 [32]	4, 0 [6]	300	117 [233]	11, 27 [19, 55]
17	double-circuit configuration would result in field equal or less than the values shown for case 8						

* Occurs under existing line

** Average currents for existing line not provided; fields estimated for proposed corridor.

CHAPTER 4



CHAPTER 5

CONSULTATION AND COORDINATION

CHAPTER 5
CONSULTATION AND COORDINATION

INTRODUCTION

In response to the National Environmental Policy Act of 1969 (NEPA) and the Council of Environmental Quality (CEQ) regulations (1978) for implementing NEPA, an extensive coordination program was developed for the Southwest Intertie Project (SWIP) to ensure that the all the appropriate members of the public and federal, state, and local agencies were contacted, consulted, and given an adequate opportunity to be involved in the process. This section describes the public and agency scoping process, the public participation program, the issues and concerns identified from the public's and agency comments, and the environmental planning process.

The scoping phase of the SWIP Draft Environmental Impact Statement/Draft Plan Amendment (DEIS/DPA), covered in this section, consisted of a regional environmental study to identify reasonable and feasible alternative transmission line routes, agency contacts for purposes of gathering data and disseminating project information, and public and agency scoping meetings to identify issues. The regional study area covered approximately 80,000 square miles (also refer to Chapter 2 and Figure 2-1).

PUBLIC AND AGENCY SCOPING PROCESS

The DEIS/DPA process was begun with the filing of a Right-of-Way Application by Idaho Power Company (IPCo) on September 29, 1988 with the Bureau of Land Management (BLM) to construct a transmission line from Midpoint Substation near Twin Falls, Idaho to a new substation near the Intermountain Generating Station near Delta, Utah. Subsequent to this application, BLM determined that an Environmental Impact Statement (EIS) and Plan Amendment would be required. The NEPA requires an EIS to be completed when a federal action, in this case a right-of-way grant to construct a 500kV transmission line across federal land, has potential for significant environmental impacts. The plan amendment was required by BLM because of the potential for the route to be located outside of corridors established in various BLM Resource Management Plans (RMPs), Management Framework Plans (MFPs), or Forest Service (FS) Land and Resource Management Plans (Forest Plans).

Dames & Moore was selected by BLM as the third-party contractor to prepare the DEIS/DPA. A regional study to identify reasonable and feasible alternative transmission line routes was completed in December of 1988. Also during this period, IPCo determined that an intermediate substation would be required in the Ely, Nevada area.

Preliminary comments were obtained from the public following the first newsletter, and from the initial meetings with the various federal, state, and local agencies. The regional study, along with agency meetings and newsletters, were the initial step in the scoping process. The BLM assumed the role of lead federal agency. The Bureau of Reclamation (BOR), the National Park Service (NPS), and the FS, were identified as cooperating agencies during this process and entered into a Memorandum of Understanding with the BLM to cooperate in preparing the DEIS/DPA.

The public involvement program during the regional environmental study involved disseminating information on the results of the studies and soliciting public comment. The public involvement program also introduced the public to the EIS/PA process and established key agency and public contacts. Seven public scoping meetings were held in six locations (two in Ely, Nevada) to further facilitate identifying the public and agency issues (refer to later sections in this chapter).

Information developed during the scoping process formed the basis for the identification of alternatives and the plan of work for the SWIP DEIS/DPA inventory, impact assessment, and mitigation planning studies. The scope of these studies was developed through a comprehensive and systematic process:

- review of previous environmental studies
- public information fact sheet and responses
- agency contacts and consultation
- public scoping meetings and planning workshops

As directed by the CEQ regulations (1978), the extent of analysis for the issues and concerns raised during the agency and public scoping process were determined through consultation among the lead and cooperating agencies. Additional information on this process is provided in the sections that follow.

The project was expanded with an amendment to the Right-of-Way Application on May 7, 1990 to include a route extending south of Ely, Nevada to a new substation site in the Dry Lake valley in southern Nevada (also refer to Chapter 2).

Previous Projects

Existing published and unpublished environmental data, maps, reports, and statements prepared for previous transmission line related projects in the area were reviewed and evaluated to determine their applicability and adequacy for use in the environmental studies. The most relevant information was included from the following reports:

- Intermountain Power Project EIS
- Midpoint to Malin 345kV Transmission Project EIS
- White Pine Power Project EIS
- Thousand Springs Power Plant Draft EIS
- Harry Allen Generating Station EIS

Intermountain Power Project - In November 1979, the BLM released a Final Environmental Impact Statement (FEIS) for a Utah, California, Nevada, and Wyoming joint venture to construct a 3,000-megawatt coal fired generating station at Salt Wash site in Wayne County, Utah. A Record of Decision approving the project was later issued. The power would be distributed to six municipalities in California and participating utilities in Nevada and Utah. The project consists of a generating station, support facilities, and transmission lines. A right-of-way application for 39,500 acres on public land was granted and 4,640 acres of public land were conveyed for power plant facilities. The second transmission line portion of the right-of-way grant was also granted, and was transferred to Los Angeles Department of Water and Power (LADWP) on behalf of the participants of the Utah-Nevada Transmission Project (UNTP) in 1990.

Midpoint to Malin 345kV Transmission Line - In July 1977 BLM released a FEIS for a 345kV transmission line proposed by Sierra Pacific Power Company and IPCo. A subsequent Record of Decision approved the right-of-way grant and construction of the project. The transmission line crosses private, BLM, and state lands in Nevada and Idaho. The 240 mile long transmission line extends due south of Midpoint substation to Rock Creek. There it turns southwest crossing U.S. Highway 93 eight miles north of the stateline. The corridor continues southeast to the Valmy and Oreana substations in Nevada. Additional construction included the new substation at Valmy and new access roads.

White Pine Power Project - In August 1984, the BLM released a FEIS in which White Pine County, Nevada Power Company, and Sierra Pacific Power Company proposed to construct a two-unit, 1500 megawatt coal-fueled, steam-electric generating facility in White Pine County, Nevada. The Record of Decision approving the project was issued in 1985. The site is located on 2250 acres of land currently administered by the BLM. Eight entities in Nevada and six municipalities in California contracted the electrical output of the project.

Thousand Springs Power Project - A DEIS was released by BLM in January, 1990 to construct and operate an eight-unit, 2,000 MW, coal-fired, steam electric power plant in Elko County, Nevada. Thousand Springs Generating Company, a consortium of private investors led by Sierra Pacific Resources, proposed to enter into a land exchange with BLM involving some 15,960 acres of public land and 13,410 acres of private land on a surface-estate-only basis. The project proposed to market electrical energy to utilities in Nevada, California, Oregon, Washington, and Idaho. In 1991 permitting efforts were discontinued and a FEIS was not released on the project.

Harry Allen Generating Station - In 1980, four utilities and a county water conservancy district received a BLM right-of-way grant to develop the proposed Allen Warner Valley energy system. The 2,000 MW Harry Allen powerplant, a section of this system, would be located in Dry Lake, Nevada. Water to cool the Harry Allen plant would be supplied through Clark County (Nevada) Advanced Wastewater Treatment Facility via a 24.5 mile long pipeline. The electrical transmission and supporting communication systems would deliver power to market areas in Utah, Nevada, and California.

Public Participation Program

To facilitate disseminating information and involving the public in the decision-making process for the SWIP, a comprehensive public participation program was developed to meet four objectives:

- establish and maintain the credibility of the technical studies with the public
- inform and educate the public as to the need for the project and possible effects to the environment
- accurately identify and consider the issues and concerns of the public and agencies
- assure that public input and agency policy are integrated with technical data into the overall decision-making processes

The following sections describe how the public was informed about the project and what opportunities were made available for the public to become involved in the DEIS/DPA planning process.

Public Information

During the course of the project a series of newsletters, fact sheets, and project updates were published to inform the interested parties about the environmental process, the project status, and opportunities to participate. Publications were sent out to the individuals, organizations, and agencies on the project mailing list. The mailing list included names and addresses from the lead and cooperating agencies' and IPCo's existing mailing lists, as well as all potentially affected federal, state, and local agencies and environmental organizations. The mailing list was expanded to include about 3,000 interested parties during the process. Copies of all the newsletters, fact sheets, and project updates are located in the Objectives, Procedures, and Results technical report.

Many of the project information publications contained a response sheet for readers to detach and mail to the project team. The sheets were designed to provide respondents an opportunity to participate in the project's public process and to request additional

information about the project. Through the response sheets, the public was provided a mechanism to express their concerns and opinions about the proposed project, the routing alternatives, and the DEIS/DPA process. Response sheets requested the following information:

- name and address of the respondent
- whether or not the respondent wished to receive a copy of the DEIS/DPA
- to list names and addresses of other people the respondent felt should be included on the project mailing list
- if the respondent would like to receive other information about the project
- if the respondent had any comment on existing routing alternatives, new alternative routing alternatives, or other aspects of the project
- to list issues of concern and specific areas or resources that should be avoided or considered when siting the transmission line

The first public information release was a fact sheet in March 1989 that announced the project and described IPCo's plans. This fact sheet was mailed to the more than 1,200 names on the list at the time. This fact sheet introduced the DEIS/DPA process, and included project background, a brief project description, the locations and times of scheduled public scoping meetings, and a schedule of project milestone dates.

A newsletter was published in July 1989 to respond to questions about the project purpose and need. This newsletter also summarized the issues of concern raised at the public scoping meetings and contained information on the project participants and a general description of project scope, planning process, and schedule. A map illustrated the regional study area and the alternative corridors discussed at public scoping meetings.

In August 1989, a brief project update was released to announce the identification of a major new alternative from the North Steptoe Valley in Nevada to the Confusion Range in Utah. A map was included to illustrate the general location of the alternative. This update conveyed a brief background of how and why the new alternative was included in the environmental studies. Another project update released in October 1989 announced the extension of the project schedule to accommodate additional environmental studies needed for the new alternative.

Another new alternative along the Juab-Millard county line in Utah was announced in the project update released December 1989. This project update conveyed the reasons and circumstances behind the addition of the new alternative, and contained a map illustrating the location of the new routing segments.

In June 1990, a fact sheet announced the expansion of the SWIP south to a new endpoint northeast of Las Vegas, Nevada, to facilitate transporting power to a connection point

with other regional transmission facilities. This fact sheet was mailed to the original mailing list of over 1,200 plus an additional 1,700 individuals and organizations provided by the Las Vegas District of the BLM. The fact sheet announced the times and locations of three additional public scoping meetings in southern Nevada. The fact sheet explained that previously other lines were planned to be built from the Las Vegas area north to Ely, Nevada, before completion of the SWIP. However, the SWIP was now projected to be the first transmission line completed. Formal notification of the project expansion appeared in the Federal Register on June 4, 1990.

A project update was released in October 1990 detailing additional alternatives requested by the U.S. Air Force at Nellis Air Force Base in Nevada. These alternatives resulted from concerns for low-level aircraft operations raised by military representatives at the public scoping meetings held in June 1990. A response sheet was mailed with this project update to obtain feedback about the additional alternatives.

The project update released in December 1990 announced the completion of the detailed environmental resource studies. The information in this update included a brief summary of the results of the resource studies and a synopsis of the planning process. A response sheet was included to once again provide the public with an opportunity to comment.

The addition of several localized alternatives to the east of the Arrow Canyon Range and across the Moapa Indian Reservation northeast of Las Vegas was announced in a project update released in November 1991. The new alternatives followed concerns expressed by the Las Vegas District of the BLM for desert tortoise habitat in Coyote Spring Valley and Hidden Valley. This update announced a public information meeting held at the Tribal Hall of the Moapa Band of the Paiute.

Public Scoping and Input

Public scoping meetings were held in four communities during the last week in March 1989. In addition to the notice published in the Federal Register, notification of the meetings also appeared in newsletters mailed to the project mailing list. A press release and map were sent to 14 newspapers serving the communities in the study area. The public scoping meetings were held in:

- Twin Fall, Idaho
- Wells, Nevada
- Ely, Nevada
- Delta, Utah

The purpose of the scoping meetings was to:

- inform the public of the project and solicit their participation in the project planning process

- obtain public and agency input on significant issues of concern that should be addressed

- obtain public comment on concerns about adjustments to alternatives being considered

- focus the scope of the future detailed environmental resource studies for the DEIS/DPA

Each meeting began with a presentation by representatives of BLM, IPCo, and Dames & Moore. The presentation addressed the project description, purpose and need, DEIS/DPA planning process, results of the regional environmental studies, alternative routes identified, and the project schedule. The meeting also provided a forum for public input.

Over 85 people attended the public scoping meetings in March 1989. All public comments from the BLM scoping meetings were recorded and summarized by resource or issue. This comment summary was used to identify key issues for the environmental studies and to identify individuals and organizations that have an interest in the project studies. Some of these individuals and organizations were contacted to obtain further information or to identify others who should be informed of the project.

Frequently voiced comments included:

- preference that route remain on public lands and not cross private lands

- route use existing transmission line corridors

- minimize impacts on sensitive visual resources, existing or planned land uses, and cultural and biological resources

- potential conflicts with military aircraft operations

The scoping process also included meetings with federal agencies whose lands or resources may be affected by the proposed project, including the various offices of BLM, FS, and NPS. These agencies made specific recommendations for corridors or areas that were determined to be unsuitable for transmission line routing, or conversely those corridors that may be recommended by agency land management plans. Other corridors not previously identified were recommended for further consideration. Also, scoping served to help eliminate alternative routes from detailed consideration (refer to Chapter 2).

A newsletter was distributed in July 1989 that summarized the results of the scoping meetings and the alternatives that were to receive detailed environmental study.

As a result of the expansion of the SWIP south to an endpoint in the vicinity of Las Vegas, Nevada, three additional public scoping meetings were held in June 1990. These

meetings were held in Ely, Caliente, and Las Vegas to inform the public of changes to the project description and to solicit comments on issues of concern in areas affected by the expansion.

On December 17, 1991, a public information meeting was held at the Tribal Hall of the Moapa Band of the Paiute. The purpose of the meeting was to present the project description, purpose and need, DEIS/DPA planning process, and new alternatives identified east of the Arrow Canyon Range northeast of Las Vegas. The meeting also provided a forum for public input.

Summary of Issues and Concerns

As a result of all public scoping meetings, the following list summarizes the major issues and concerns expressed by the agencies and public:

- visual impacts
- maximize use of public lands
- use of existing transmission line corridors
- minimize land use impacts
- minimize impacts to cultural resources
- minimize impacts to biological resources
- property values

The Objectives, Procedures, and Results technical report contains detailed lists of specific issues, concerns, and comments summarized in the list above.

Publish Notice of Intent

A Notice of Intent to prepare an EIS/PA for the Southwest Intertie Project was published in the Federal Register (Vol. 54, No. 41) on March 3, 1989. The notice described the project, the environmental planning process, the plan amendment process, the times and locations of scheduled scoping meetings, and the applicable legislation and regulations. The anticipated environmental issues outlined in the notice included visual resources, sensitive land uses, cultural sites, threatened or endangered plants and animals, and important wildlife habitats.

Formal notification appeared in the Federal Register on June 4, 1990 to inform the public of the expansion of the SWIP south to a new endpoint in the vicinity of Las Vegas, Nevada.

Planning Workshops

Six public planning workshops were held in January and February 1991 by the BLM and the cooperating federal agencies to:

- report results of the environmental studies for the alternative corridors
- present the preliminary alternative transmission line routes
- gain public input on the acceptability of the preliminary alternative transmission line routes

The planning workshops were held in the following locations:

Twin Falls	Idaho	January 7, 1991
Wells	Nevada	January 8, 1991
Ely	Nevada	February 13, 1991
Delta	Utah	February 14, 1991
Las Vegas	Nevada	February 20, 1991
Caliente	Nevada	February 21, 1991

These workshops were noticed in the December 1990 SWIP newsletter, distributed to the almost 3,000 on the mailing list. Press releases were sent to eight newspapers serving the communities in the area to inform the public of the workshops. Flyers were also posted in and around public establishments in the communities where the meetings were held.

The remainder of this section briefly summarizes each of the public workshops. Public comments, issues, and concerns were recorded at each meeting and are documented in the Objectives, Procedures, and Results technical report.

The Twin Falls workshop meeting was attended by 20 people. The primary concerns expressed involved the location of towers on agricultural lands and visual impacts to the Hagerman Fossil Beds National Monument. On agricultural lands the concern was the potential for conflicts between tower locations and farm machinery, crop irrigation systems, and aerial spraying operations. Generally, people expressed a preference that the proposed project use existing transmission line corridors.

In Wells, the workshop meeting was attended by a few local ranchers. The primary concern was the potential visual effects of the project and conflicts with ranching operations in Goshute Valley. Route A was considered unacceptable by the ranchers because of its proximity to their homes. The ranchers preferred Route E, because it would be located farther from their property.

Eighteen people attended the Ely workshop meeting including representatives from the BLM, NPS, White Pine Power Project (WPPP), Farm Bureau, Soil Conservation Service, Nellis Air Force Base (AFB), and Mt. Wheeler Power Cooperative. The primary concerns expressed at this meeting were the cost of the project, and which route would bring the

county the most benefit while also being environmentally acceptable. The length of the Southern Route was considered unreasonable and the least desirable route. The 230kV Corridor Route was considered the preferred route because it best met their cost criteria and it would use an existing transmission line corridor.

The Delta workshop meeting was attended by 13 people that included representatives from the NPS, the Utah Fish and Game Department, the Wildlife Federation, Nellis AFB, and Millard County. General consensus at the workshop was that no more transmission lines should be built in the area. The Cutoff Route was generally the preferred route because it was remote (i.e., out of view), away from the views encountered by tourists, and bypassed Great Basin National Park. The Delta Direct Route was the least favored route because it would not cross Millard County (i.e., tax benefits), it would not use an existing utility corridor, could cause potential conflicts with military aircraft operations in the restricted area, and could cause impacts to the Leland-Harris spring complex. The 230kV Corridor Route was preferred by Millard County because it would use an existing transmission line corridor. However, it was opposed by other people because the corridor is closest to Great Basin National Park. Millard County was strongly opposed to the southern substation site near Sevier Lake. The site at Intermountain Generating Station was favored because of its proximity to existing facilities. The Southern route was opposed because it would cross prime antelope and elk habitat and much undisturbed area.

The workshop meeting in Las Vegas, Nevada, was conducted as an open house. Some questions/comments brought up concerned the military flying operations, desert tortoise habitat, exclusion areas for land uses, and the Aerojet land exchange. No route preferences were recorded at this meeting.

The workshop meeting in Caliente, Nevada, was attended by several local people including representatives from Lincoln County Cooperative and Sierra Pacific Power Company. The primary concerns expressed were for visual impacts and tax revenues to the county.

Agency Contacts

Agencies and organizations having jurisdiction and/or specific project interest within the study area were contacted to inform them of the SWIP, to verify the status and availability of existing environmental data, and to solicit their input to the study process. Concerns and recommendations for potential transmission line corridor locations were discussed and documented.

In addition to contacts by principal resource investigators, management-level contacts were made with key offices of the BLM, FS, BOR, NPS, some state agencies, and the potentially affected counties throughout the three states. Suggestions for modifications to the alternative corridors were incorporated into the studies.

Agency scoping meetings were also held with agency management resource specialists at each involved agency office prior to initial public scoping meetings in March 1989 and the additional scoping meetings held in June 1990. The purpose of these briefing meetings was:

- to inform BLM representatives with different areas of expertise about the project and respond to their questions. A related objective was to limit the need for agency representatives to attend the public meeting so that the meeting could focus on local residents

- to identify potential local concerns so that each evening's presentation could be responsive to key issues

Documentation of each of the scoping briefing meetings can be found in the SWIP project files, the Scoping Document, and the Objectives, Procedures, and Results technical report. In addition, a summary of all agencies contacted is documented in the Objectives, Procedures, and Results Technical Report.

Meetings with County Commissioners

Members of the project team from IPCo and Dames & Moore met with the county commissioners of each of the potentially affected counties. The purpose of the meetings was to disseminate information regarding the project, including issues and the location of alternative routes and substation, and to discuss any county permitting requirements. The following meetings were held:

Idaho	Jerome County, Idaho - March 13, 1989 Twin Falls County, Idaho - March 28, 1989 Cassia County, Idaho - July 24, 1989 Gooding County, Idaho - July 26, 1989 Lincoln County, Idaho - August 7, 1989
Nevada	Elko County, Nevada - March 15, 1989 White Pine County, Nevada - March 22, 1989 and August 22, 1990 Lincoln County, Nevada - August 20, 1990 Nye County, Nevada - September 5, 1990
Utah	Millard County, Utah - May 2, 1989 Juab County, Utah - January 16, 1990

Steering Committee

A Steering Committee was established at the outset of the project studies to guide Dames & Moore through the EIS preparation and to review data and decision criteria. The Steering Committee was comprised of representatives of:

- Bureau of Land Management
  - Burley District (Idaho)
  - Boise District (Idaho)
  - Shoshone District (Idaho)
  - Elko District (Nevada)
  - Ely District (Nevada)
  - Las Vegas District (Nevada)
  - Richfield District (Utah)

- Forest Service
  - Humboldt National Forest (Nevada)

- National Park Service
  - Great Basin National Park (Nevada)

- Dames & Moore

- IPCo

- LADWP

The first Steering Committee meeting was held on February 6, 1989. This initial meeting outlined the coordination needed for the project, the Federal Register notice for the public scoping meetings, and established that BLM would be the federal lead agency, with the FS and the BOR as cooperating agencies. It was agreed that a Memorandum of Understanding (MOU) would be signed by the BLM, FS, and IPCo.

Also discussed was the progress of the regional environmental studies and the selection of alternative transmission line corridors. The committee felt that several of the alternative corridors should be presented in the public scoping meetings as being recommended for elimination from further consideration.

The committee felt it important to coordinate with governor's clearinghouses for regulatory compliance as well as with the individual counties in the three states involved in the project. Scoping meeting agendas and dates were discussed along with fact sheets and comment forms, mailing lists, EIS format and content, and plan amendment.

The second Steering Committee meeting was held on May 10, 1989. The public scoping meetings were reviewed as well as some of the responses and letters received on the first fact sheet.

Specific concerns discussed during this meeting included:

- the Minidoka Relocation Center historic preservation site on BOR land near Hunt, Idaho
- populated areas and rural agriculture areas near Hagerman, Idaho and Contact, Nevada
- the O'Neil Basin alternative (the farthest western route near the Nevada-Idaho border)

An alternative around the Great Basin National Park and a Nevada State Highway 6/50 alternative east to King's Canyon were also discussed. In addition, the committee also discussed possible revisions to the preparation plan.

Wildlife was the major topic of discussion at this meeting, including sage grouse, eagles, ferruginous hawks, and wild horses and burros. Other issues covered were Native Americans, cultural resources, microwave sites, substation locations, and the BLM land report.

The third Steering Committee meeting was held on August 23, 1989. The focus of this meeting was the discussion and review of BLM actions on the SWIP including administrative record requirements, right-of-way applications, and plan amendments. Also discussed were tower heights in regard to air flight testing and training in the Air Forces operations areas. Comments were reviewed on the scoping report for the regional study. Other issues included a discussion of DEIS data, progress on inventory and impact assessment, the mitigation plan and specific measures to reduce impacts, and location of substations.

The fourth meeting of the Steering Committee was held November 4, 1989. Agenda items included status of the National Park Service (NPS) as a cooperating agency, alternatives addressing FS concerns in Cooper Canyon, the mitigation for the Minidoka Relocation Center, a new alternative route between North Steptoe area to the Delta Direct Route, Hill Air Force Base conflicts, the project schedule, an inventory update, and the impact assessment/mitigation planning process.

The fifth Steering Committee meeting was held on April 19, 1990. Topics of discussion included the SWIP scope expansion, right-of-way application amendments, the Federal Register notice, review and discussion of the draft purpose and need statement, and mapping of the WPPP corridor. Dames & Moore presented and discussed the substation site selection process, the subroute analysis process, and GIS processing for resource impacts.

The sixth Steering Committee meeting was held on June 20th, 1990. The meeting began with a discussion of the steering committee's comments on the draft purpose and need statement. The committee also discussed the announcement of dates for scoping meetings, the results of the GIS impact assessment modeling, the subroute analysis process, and the feasibility of expanding the SWIP south of Ely.

The seventh Steering Committee meeting was held on September 6, 1990. The opening discussion at this meeting was Clark County's desert tortoise Habitat Conservation Plan. The plan outlines portions of several desert tortoise habitat categories (Category I, II, or III) that may be proposed to be set aside as preservation areas. The steering committee discussed how this plan should be addressed in the SWIP studies and how the "no net loss" of habitat policy would affect the development of transmission lines into the Las Vegas area. The steering committee also discussed the use of utility corridors through the Apex industrial area, the route selection process, an updated project schedule, the Dry Lake alternatives, the Sunrise Mountain EA, and mitigation commitments by the utilities.

The eighth Steering Committee meeting was the first of a series of meetings held over a three day period, December 11-13th 1990. The steering committee discussed the DEIS/DPA outline, the purpose and need statement, and effects of the impact assessment results on routing alternatives. The steering committee also discussed possible alternatives in the vicinity of the Moapa Indian Reservation. The Las Vegas District of the BLM requested that several alternatives to the WPPP corridor be added to the studies. The committee agreed that the desert tortoise issue in Arrow Canyon warranted the evaluation of the Moapa alternatives. This decision initiated a feasibility study to determine if there were reasonable and feasible alternatives. In addition, there was continuing discussion of the Sunrise Mountain EA, the status of mitigation commitments from the project proponents, the cumulative effects of the SWIP, and the visual effects to Great Basin National Park and Interstate 84.

The remaining meetings in December focused on determining the routing alternatives to be compared in the SWIP DEIS/DPA. Initially, resource specialists determined the routing alternative preferred by their resource area (e.g., biology, visual, land use, cultural, and earth). These "resource" preferred routing alternatives were reviewed by an interdisciplinary team to determine preliminary routing alternatives for the DEIS/DPA.

These meetings were facilitated using a consensus building (modified delphi) process to assist resource specialists and agency representatives in determining the relative importance or significance of different impacts types and levels between resources. The discussions at these meetings explored what impacts or types of impacts to which resources are more or less important to consider than others when selecting an environmentally preferred route.

A preliminary DEIS/DPA was submitted to the Steering Committee at the ninth meeting on July 25, 1991 for review. The steering committee discussed the addition of several new routing alternatives to the east of Arrow Canyon Range that might avoid potential conflicts with desert tortoise habitat in Coyote Spring Valley and Hidden Valley. The issue of potential visual impacts to WSAs was also discussed. The environmentally preferred alternative was presented and discussed followed by some discussion of the utility and agency preferred alternatives.

The tenth Steering Committee meeting was held on March 12, 1992 to discuss the results of studies in the Coyote Spring Valley and across the Moapa River Indian Reservation, complete a final review of comments on the preliminary DEIS/DPA, and to discuss the

Stateline Resource Area of BLM's Draft RMP and ongoing desert tortoise consultation and Habitat Conservation Plan.

Public Review of DEIS/DPA

Public review of the DEIS/DPA will be completed during a 90-day comment period and through formal public meetings to be held in August, 1992. The Regional Forester and the State Directors of Idaho, Nevada, and Utah will file the FEIS and proposed plan amendment with the CEQ of the Environmental Protection Agency (EPA) following the 90-day review period.

The governors of the states of Idaho, Nevada, and Utah will have a 60-day consistency review on the FEIS to determine if the final recommended action is consistent with state and local government plans and policies. IPCo will be required to comply with applicable requirements of the states of Idaho, Nevada, and Utah, as well as county and local regulations in affected areas.

The Regional Forester will issue a Record of Decision for FS lands with the EIS/PPA. The State Directors of the BLM will jointly publish the Record of Decision for public lands crossed by the selected alternative. The BLM Record of Decision will be filed 30 days after closing of the public comment period on the FEIS/PPA. The BOR will also issue a Record of Decision if their lands are crossed by the selected alternative.

Formal Consultation with Federal Agencies

Biological Resources

To comply with the Endangered Species Act (1973) as amended and the implementing regulations for Section 7 consultation, species lists were requested from the United States Department of the Interior Fish & Wildlife Service (FWS) at the beginning of the EIS process (also refer to the Biological Resources technical report). The following FWS offices were contacted during this process:

- Boise Field Office, Idaho - species list 1-4-89-SP-355 was provided from the Boise field office on August 10, 1989
- Salt Lake City, Utah - species list 1-4-89-SP-355 was provided on August 10, 1989
- Reno, Nevada - species list 1-5-89-SP-143 was provided on July 12, 1989 and species list 1-5-90-SP-308 was provided on July 19, 1990

On July 18, 1991 these same offices were again contacted to supply any updates to the species lists because of the time that had passed since the original requests. Formal

Section 7 consultation with the FWS will begin with submittal of a biological assessment for desert tortoise, ferruginous hawk, bald eagle, and peregrine falcon.

Additional information regarding consultation and coordination of biological resources and threatened and endangered species is found in the Biological Resources technical report and the SWIP project files.

Cultural Resources

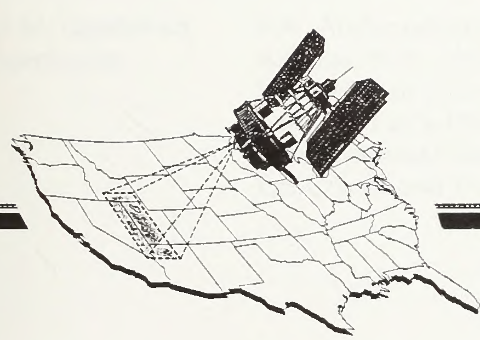
Compliance for cultural resources stems from the National Historic Preservation Act of 1966 (NHPA) as amended. The regulations implementing Section 106 of the NHPA (36 CFR Part 800) require that the lead federal agency of any federally funded or licensed action must take into account the effects of the agency's undertaking on properties included in or eligible for the National Register of Historic Places. The general thrust of the legislation is to establish a process for identifying impacts of development upon cultural resources and create opportunities for adopting measures to avoid, minimize, mitigate, or accept impacts.

Contacts with the State Historical Preservation Officers (SHPOs) from Idaho, Nevada, and Utah were first begun in 1987 during an environmental resources inventory, and has continued throughout the SWIP EIS process. In May 1989 a contact letter and a project map for the SWIP was distributed to agency cultural resource coordinators and Indian Tribes throughout the three states. These contacts included BLM cultural resource specialists and FS cultural resource coordinators.

The contacts made with the Indian tribes in each of the three states and several in adjoining states were to identify sensitive ethnographic sites or areas (also refer to Cultural Resources Technical Report). Initial contacts with these Native Americans were made in 1987 during an environmental resources inventory completed by Dames & Moore. The letters were followed by phone calls and additional letters, and several meetings were attended, as the contact program progressed. Also, over 50 environmental documents, cultural resources overviews, and key ethnographic and ethnohistoric sources were consulted.

In June 1990 the Advisory Council on Historic Preservation accepted a Programmatic Agreement regarding the treatment of cultural resources for the SWIP. The agreement was established between the BLM (federal lead agency for the EIS preparation), the BOR (cooperating agency), the Humboldt National Forest (cooperating agency), the Idaho SHPO, the Nevada SHPO, the Utah SHPO, and the Advisory Council on Historic Preservation. IPCo, as permitting agent for the SWIP, is a concurring party to the agreement.

Additional information regarding consultation and coordination of cultural resources is found in the Cultural Resources technical report and the SWIP project files.



CHAPTER 6

PREPARERS AND CONTRIBUTORS

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Lead Federal Agency

Idaho State BLM Office:

Name/Title	Education/Experience	Involvement
Butch Peugh, Environmental Specialist	B.S. Range/Wildlife Ecology, (1968) Utah State University. Has worked 26 years with BLM. Four years Fire Control Officer, 6 years as Area Manager, & 5 years as Environmental Specialist	Overall review and technical requirements for NEPA compliance.
Nancy Bloyer, Realty Specialist	B.A. Organizational Communications, (1977) University of Utah. Twelve years as a BLM Realty Specialist.	Program lead for the right-of-way program in Idaho.

Burley District BLM Office (Idaho):

Name/Title	Education/Experience	Involvement
Karl A. Simonson, Realty Specialist	B.S. Range Management, (1968), Utah State University. M.S. Range Management/Range Economics, (1969), Utah State University. Three years as a BLM range conservationist and 17 years as a realty specialist.	Program Manager for SWIP.
Chris Ketchum, District Wildlife Biologist	B.S. Wildlife Conservation, (1978) New Mexico State University. Twelve years with BLM, 4 years as a range conservationist, 8 years as a wildlife biologist.	Provided district wildlife information and review of documents.
Peter M. Laudeman, Archaeologist	B.A. Anthropology, (1968), University of Arizona, M.A. Anthropology, (1972), University of Arizona. Sixteen years with BLM as a District Archaeologist in three different districts, Rock Springs, Las Cruces and Burley.	Provided cultural resources data review of EIS documents.

Name/Title	Education/Experience	Involvement
Paul Makela, Wildlife Biologist	B.S. Natural Resources, (1979) University of Michigan, M.S. Wildlife Biology (1990) University of Montana. One and a half years as wildlife biologist and 21 months as wildlife and range technician with BLM.	Provided wildlife information and review of documents.
John Haxby, Range Technician	Two years college, University of Idaho. Maintenance work with BLM, 6 years, and Range Technician, 18 years.	Document review.
Ted Milesnick, Area Manager	B.S. Range Management, (1971), Montana State University. Range Conservationist 9 years, 7 years as Planning & Environmental Coordinator, 3 years as an Area Manager.	Development of alternatives and document review.
William Lee Boggs, Outdoor Recreation Planner	A.A. Biological Sciences, Merrit College, (1969), B.S. Environmental Resources, California State University of Sacramento, (1975). Recreation Technician 5 yrs., Wilderness Coordinator 3 yrs., and District Outdoor Recreation Planner 10 yrs.	Provided recreation, ACEC, and visual resource information along with review of documents.
Kirk L. Koch, Environmental Protection Specialist/ Watershed Management	B.S. Natural Resource Management, (1979) Arizona State University. Ten years experience in watershed management, monitoring, and rehabilitation.	Provided soil, riparian, and water quality information.
Sharon LaBrecque, Resource Area Realty Specialist	B.S. Wildlife Management. Worked 10 years as a Resource Area Realty Specialist.	Provided land use data and document review.

Shoshone District BLM Office (Idaho):

Name/Title	Education/Experience	Involvement
Robert C. Cordell, Area Manager	B.S. Range Management, (1968) University of Arizona. Worked 5 years with BLM as a Range Conservationist, 4 years as a Realty Specialist, and 10 years as an Area Manager.	Management direction for District review of documents.
Harold O. Brown, District Realty Specialist	B.S. Physical Science, (1967) Adams State College. Worked three years as a cartographer/computer specialist for Dept. of Defense. Worked with BLM 5 years as Cadastral Surveyor and 15 years as District Realty Specialist.	Provided land use and status information.

Name/Title	Education/Experience	Involvement
Joseph A. Aitken, Resource Area Realty Specialist	B.S. Agricultural Economics, (1976) University of Idaho. Worked 2 years as a loan officer for Farmers National Bank, Buhl, Idaho and worked 12 years as BLM Realty Specialist.	Provided land use data.
Paula K. Perletti, Outdoor Recreation Planner	B.S. Forest Recreation Management, (1989) Oregon State University. One year as a Recreation Planner.	Provided information on recreation, visual resources & caves.
Gary J. Wright, Wildlife Biologist	B.S. Wildlife Management/Range Management (1978), Humboldt State University. Worked as a BLM Range Conservationist for 10 years and one year as a Wildlife Biologist.	Provided wildlife and T&E species information.
John C. Lytle, Archaeologist	B.A. Anthropology, (1970), University of Wyoming. M.A. Anthropology, (1975), University of Kansas. One year as a research assistant, two years as a cultural resource surveyor for the University of Kansas, two years as a continuing education instructor, 14 years experience with BLM as an Archaeologist.	Provided cultural resources information.

Boise District (Idaho):

John Thornburg Realty Specialist	B.S. Psychology, Boise State University (1974). 10 years experience as a BLM engineering technician and 3 years as a BLM Realty Specialist.	Document input and review of land use, visual resources and socioeconomics.

Utah State BLM Office:

J. Darwin Snell, Utah State Office Realty Specialist	B.S. Range Management, (1958), Utah State University. Twenty-nine years with BLM, two years as Utah State Office Realty Specialist.	Utah State BLM Coordinator for SWIP.
Terry Catlin Utah State Office Realty Specialist	B.A. Economics, 1974. University of Utah. Seventeen years experience with BLM, 13 as a BLM realty specialist.	

Name/Title	Education/Experience	Involvement

Richfield District BLM Office (Utah):

Name/Title	Education/Experience	Involvement
Rodney P. Lee Realty Specialist	B.B.A., University of Nevada. Has worked as a BLM realty specialist for 13 years.	Reviewer, commentor and coordinator. Program Lead and on Swip Steering Committee.
Michael K. Jackson Geologist	M.S. Geology. Geologist for 3 years with BLM. Geologist in industry for nuclear waste repository siting and minerals exploration.	Document review.
David K. Young T&E Coordinator	M.A. Biology, California State University Ten years experience with BLM.	Data input for T&E species.
La Mar W. Lindsay Archaeologist	B.S. Psychology, 1965, University of Utah M.A. Anthropology, 1975, University of Utah Doctoral Program, 1977-1982, University of Utah. Work experience includes 5 years at the Univer. of Utah, 1 year at the Utah State University, 13 years at the Utah Division of State History, 3 years with BLM.	Consultation and review.
Lloyd L. Chappell Soil Scientist	B.S. Agronomy, 1963, Brigham Young University Worked 9 years with BLM, 13 years with Bureau of Reclamation, 5 years with Durango Projects Office in Durango, Colorado, 3 years with the Lower Columbia Development Office in Salem, Oregon, and 5 years with Central Utah Project.	Provided soils data.
Ferris L. Clegg Outdoor Recreation Planner	B.S. and M.A. Biological Science. Twenty-three years, biological science, four years, outdoor recreation planner.	Reviewed the draft report of the Environmental Inventory.
Philip Zieg	B.S. Range and Forestry Management, 1961. Thirty-two years with BLM.	Review and comment on Earth & Water Resources Inventoryreport.
Nancy DeMille Realty Specialist	Realty Specialist with BLM since July, 1991.	Lands and Realty input and document review.

Name/Title	Education/Experience	Involvement
Brenda Smith, Wildlife Biologist	B.S. Wildlife Ecology (1978) University of Vermont, M.S. Wildlife Biology (1983) University of Arizona. Three years as wildlife Biologist for U.S. Fish and Wildlife Service and four years with BLM, Warm Spring Resource Area.	Review and comment, provide input on wildlife and T&E issues.
Larry Sip Realty Specialist	B.S. Range Management, Utah State University, 1965. Range conservationist for 6 years, natural resource specialist for 2 years, Manager for 11 years, and realty specialist for 1 years, all with BLM.	Provided information on land Area use impact. Coordinator and member of the steering committee.
Mark A. Pierce	B.S. Biology, Southern Utah State University, 1976. Nine years as a wildlife biologist with BLM.	Coordinator for T&E species and riparian.
Paul N. Briggs Range Conservationist	B.S. Range Science, Utah State University Range Conservationist for BLM since Sept. 19, 1989.	Document review.
Melanie Mendenhall	B.S. Range Science, Utah State University, 1985. Range Conservationist for BLM for 4 years, 1 year (seasonal) for U.S. Forest Service.	Reviewer for T&E species and watershed.
Harvey Gates Supervisory Range Conservationist	B.S. Range Management. Eighteen years as a range conservationist with BLM.	Consultant on livestock/wild horses.
F. Rex Rowley	B.S. Range Management, Utah State University, 1965. Range Conservationist and Area Manager for 25 years with BLM.	Document review.
Dave Henderson Area Manager	B.S. Wildlife Management, University of Idaho, 1971. M.S. Range and Wildlife Habitat, Washington State University, 1978. Thirteen years with the BLM 5 as a manager.	Document review.
Lynn T. Fergus	B.S. Landscape Architecture and Environmental Planning, Utah State University, 1962. Four years with U.S. Forest Service and 16 years with BLM in Outdoor Recreation and Planning.	Document review, wilderness and recreation input.

Name/Title	Education/Experience	Involvement

Nevada State BLM Office:

Ed Tilzey, Environmental Coordinator	B.S. Wildlife Technology, (1960), University of Montana, U.S. Army Command and General Staff College, (1975), U.S. Air Force War College, (1983), Bureau of Commercial Fisheries, one year, Range-Recreation-Wildlife Specialist, 11 years, Wildlife Biologist, 4 years, Environmental Coordinator, 14 years.	Overall coordination and review for Nevada.

Las Vegas BLM District (Nevada):

Robert K. Taylor Recreation & Wilderness Specialist	B.S. Landscape Architecture, University of Arizona (1975) 16 years experience with BLM.	Recreation and wilderness input and review.
Patricia L. Hall Realty Specialist	Thirteen years experience as a realty specialist in the Las Vegas District.	Lands & realty input and document review.
Stanton Douglas Rolf Archaeologist	B.A. Archaeology, University of Arizona, (1972). M.A. Progress Cultural Resource Management. Has worked 4 years as California Desert Archaeologist and 14 years experience as the Las Vegas District Archaeologist.	Cultural resources review
Sidney C. Slone Wildlife Biologist	B.S. Natural Resources with Wildlife Management Major, Ohio State University, (1976). Has worked 14 years as a wildlife biologist.	Review of T&E species and Sec. 7 consultation with FWS regarding desert tortoise.
Runore Wycoff Area Manager	A.A. Arts & Sciences, Oakland Community College (1975), B.S. Park Administration, Michigan State University (1978), B.S. Resource Development, Michigan State University (1978), M.S. Resource Planning, University of Maryland (1980). Outdoor Recreation Planner for the Heritage Conservation and Recreation Service for 2 years, BLM Natural Resource Specialist for 6 years and Stateline Resource Area Manager for 4 years.	Policy and decision responsibility for the Stateline Resource Area.

Name/Title	Education/Experience	Involvement
Jerry C. Wickstrom Environmental Coordinator Stateline RMP Team Leader	Attended 3 years of Geological Engineering study at the South Dakota School of Mines, B.S. Wildlife Management, South Dakota State University (1962). Has worked 1 season with Bureau of Commercial Fisheries in Alaska, 3 years experience as BLM Land Examiner/ Realty Specialist, 3 years experience Wildlife, Range, and Watershed Specialist, 5 years experience as a Wildlife Biologist, Fisheries Biologist, Recreation Specialist and Land Use Planner, 4 years as BLM Environmental Coordinator at Alaska State Office - BLM, 6 years experience in working as BLM Assistant. Chief and Chief of the Alaska National Petroleum Reserve, 7 years as President, owner and manager in the private sector in Commercial Investments, Commercial Real Estate, Environmental Consulting and international trade. Two years at Las Vegas, Environmental Coordinator, Land Planner, Hazardous Waste Specialist.	Coordination, policy review and scoping
Jeff Steinmetz Supervisory Natural Resource Specialist	B.S. Range Management, Humboldt State University. Has worked as Range Conservationist/Ecological Status Inventory Coordinator for 10 years and 3 years as BLM Supervisory Natural Resource Specialist/ Environmental Coordinator.	Environmental coordination and document review.
Curtis G.Tucker Area Manager	B.S. Forestry, Utah State University (1970). Has worked as BLM Natural Resource Specialist 3 years, 5 years as Outdoor Recreation Planner, 8 years as Environmental Specialist, 5 years as Area Manager.	Management review and comment.
Timothy M. Murphy Supervisory Range Conservationist	B.S. Range Management, University of Wyoming (1978). Range Technician FS 3 seasons, BLM Range Conservationist 6 years and Supervisory Range Conservationist 3 years.	Document review.
Dawna Ferris Archaeologist	B.A. Romance Language, University of Maine, M.A. French, University of New Mexico, B.A. Anthropology, University of Nevada, M.A. Anthropology, University of Nevada, Has worked as an archaeologist for 6 years and as Archaeologist/Environmental Coordinator.	Cultural resource and environmental compliance/ review. 1 year.

Name/Title	Education/Experience	Involvement
Marc Pierce Forestry/Recreation Planner	B.S. Forestry, University of Nevada (1989) Has worked with FS as Forestry Tech. for 2 seasons, Forestry Tech. for Boise Cascade Corp 5 months, and BLM Forestry/Recreation for 4 months.	Document review.
Cory Bodman Soil Scientist	B.S. Natural Resource Management, Tennessee Technological University (1977). Has worked as BLM Soil Scientist for 12 years	Soil input and document review.
Larry Lacy Surface Protection Specialist	Has worked as BLM Engineering Equipment Operator 7 years, Range Tech. 8 years, Surface Protection Specialist 5 years.	Document review.
Kyle Teel Wildlife Biologist	B.S. Agriculture with major in Wildlife Science, New Mexico State University (1990). Has worked as BLM Wildlife Biologist for 2 years.	Document review.
Terry Smith Range Conservationist	B.S. Agriculture, Pennsylvania State University (1978), M.S. Range Management, Washington State University (1982). Has as a Range Conservationist for 7 years.	Document review.
Michael Neff Range Conservationist	B.S. Range Animal Science, Sul Ross State University (1975). Has worked as a Range Conservationist for 14 years.	Document review.
Alan Shepherd Range Conservationist	A.S. Fish & Wildlife Management, North Dakota State University(1986), B.S. Wildlife Management, University of Idaho (1989), B.S. Range Management, University of Idaho (1987). Has worked as FS Range Technician for 2 summers and BLM Range Conservationist 1 yr.	Document review.
Michael Fewell Range Technician	High School (1978). Has worked as BLM Range Technician for 5 years.	Rangeland resource input.
Jule Wadsworth Range Conservationist/ Wild Horse & Burro Specialist	B.S. Range Science, Brigham Young University (1982), M.S. Range Science, Brigham Young University (1988). Has worked as BLM Range Conservationist/Wild Horse & Burro Specialist for 2 years.	Consultation and document review--wild horses.

Name/Title	Education/Experience	Involvement

Ely BLM District Office (Nevada):

Name/Title	Education/Experience	Involvement
William D. Robison Geologist	B.S. Geology, San Diego State University, 1978. Ten years experience as a geologist with BLM and 3 years as a petroleum geologist with U.S. Geological Survey.	Document review.
Gene L. Drais Area Manager	B.S. Zoology, Brigham Young University, 1972. Four years experience as an outdoor recreation planner with Heritage Conservation and Recreation Service, 8 years as an outdoor recreation planner with BLM and 5 years as an Area Manager with BLM.	Document review.
Mark J. Barber Wildlife Biologist	B.S. Wildlife Management, Oregon State University, 1968, Post Baccalaureate at Oregon State University, 1972. Seven years experience with the U.S. FWS and 12 years with the BLM. Certified Wildlife Biologist in 1982.	Provided information on T&E species, wildlife life and riparian.
Harry T. Rhea Forester	B.S. Forest Management, University of Tennessee 1971. Five years experience with the Forester Peace Corps, 2 years with U.S. Forest Service, 13 years with BLM.	Provided information on riparian and sensitive forest species.
Daniel R. Netcher Geologist	B.S. Geology, University of Oregon, 1985. Seven years experience with BLM.	Provided mineral and geologic information.
William J. Lindsey Range Conservationist	B.S. Rangeland Resource Management, Oregon State University, 1979. Thirteen years experience with BLM.	Range management & vegetation review.
Fred Fisher Range Conservationist	B.S. Range Management, UNR, Reno, Nevada, 1979. Six years (seasonal) experience with Forest Service, 1 year (seasonal) with BLM (Cadastral Survey), and 13 years with BLM as a range conservationist.	Provided information on range and mapping.
Mark S. Henderson Archaeologist	B.A. Archaeology, University of New Mexico, 1974. Two years experience as a research archaeologist with the Southern Methodist University, 1 year as an archaeologist with U.S. Forest Service, and 13 years with BLM.	Reviewed cultural resource data.

Name/Title	Education/Experience	Involvement
Michael W. Perkins Wildlife Biologist	B.S. Wildlife Science and B.S. Fish Biology, Utah State University, 1974, and Associate Degree in Forestry, Syracuse University, 1969. One year experience with New York State Dept. of Environmental Conservation, 6 years with the FWS, 1 year with the Bureau of Reclamation, 13 years with BLM.	Wildlife review
Jacob A. Rajala Natural Resource Specialist	B.A. Anthropology, Washington State University, 1972, M.A. Anthropology, WSU, 1975, M.S. Forest & Range Management, WSU, 1978. Fourteen years experience with BLM.	Document review provided general information
Ronald E. Sjogren Realty Specialist	B.A. Geography, San Diego State University, 1962. Thirty years experience with BLM in Riverside, California, Las Vegas, Nevada and Ely, Nevada.	Ely District SWIP coordinator and document reviewer.
Loran A. Robison Watershed Specialist	B.S. Range Management and B.S. Forest Management, 1976. One and one-half years experience of inventory and watershed studies with Utah State University, one year with U.S. Forest Service, 13 years with BLM.	Provided information on water resources.
Jay A. Ruegger Soil Scientist	B.S. Soil Scientist, Southern Illinois University, 1977. Seven years experience with BLM.	Provided information on soils.
Shaaron A. Netherton Supervisory Outdoor Recreation Planner	B.S. Wildlife Management, Humboldt State University, California. Thirteen years experience with BLM.	Recreation, visual resources wildernessreview.
John K. Zancanella Archaeologist	B.A., 1978 and M.A. 1987, California State University. Nine years experience with BLM.	Provided cultural cultural resource information.
Michael C. Bunker Outdoor Recreation Planner	B.S. Forestry/Outdoor Recreation Option, Utah State University. Eighteen years experience with BLM.	Recreation, visual resources wildernessreview.
Brian C. Amme Archaeologist	B.A. (Honors) Degree Cultural Anthropology, University of California. Seven months experience with U. S. Forest Service, 7 years with BLM.	Cultural resource review.

Name/Title	Education/Experience	Involvement
Paul E. Podborny Wildlife Biologist	B.S. Wildlife Ecology, University of Arizona, 1975, M.S. Range Management, University of Arizona, 1978. Fourteen years experience with BLM.	Provided information and document review.
Robert E. Brown Wild Horse and Burro Specialist	B.S. Zoology, University of Arizona, 1968. Fifteen years experience with BLM.	Provided wild-horse and burro info and document review.

Elko BLM District Office (Nevada):

Name/Title	Education/Experience	Involvement
David J. Vandenberg Planning/Environmental Coordinator	B.S. History, Lynchburg College, 1973, Range Ecology, Arizona State University, 1976-1977. Range technician, 4 years, realty specialist, 13 years, environmental coordinator, 2 years.	SWIP program lead for Elko District.
Steve Dondero Outdoor Recreation Planner	B.S. Wildlife Management, Humboldt State University, 1978. Wildlife technician, 1 Year; range conservationist, 5 years; range conservationist/outdoor recreation planner, 6 years; and outdoor recreation planner, 1 year.	Reviewer of VRM compliance, recreation viewpoints, scenic quality, etc.
Gary Bowers Realty Specialist	B.S. Range Management, Texas A & M. Range conservationist, 3 years, realty specialist, 9 years.	Transportation and access and realty related matters.
Roy Price Wildlife Biologist	B.S. Renewable Natural Resources (Wildlife and Range Management), University of Nevada, 1975. Wildlife technician, 6 months, range conservationist, 2 years, wildlife biologist, 13 years.	Review and input put of threatened and endangered species.
Tim Murphy Archaeologist	B.A. Anthropology, University of Arizona, 1973. Archaeologist, 15 years.	Review and input of cultural resources and paleontology.
Steve Kiracofe Soil Scientist	B.S. Agronomy-Soil Science, University of Maryland, 1976. Soil Scientist, 10 years.	Provided input on soil, water, watershed, air, and reclamation

Name/Title	Education/Experience	Involvement
Sarah Hoyt Geologist	B.S. Geology, (1981), Texas Tech University. Worked as seismic data processor for Geophysical Systems Corp for 1 year, 2 years as seismologist for Geophysical Service, Inc., research assistant for 5 months for Krug International, 3 months for Western Geophysical and 2 years with BLM as a geologist.	Review of geology and minerals portion of the EIS
Douglas C. Mary Assistant District Manager - Operations	B.S. Range Management, (1979), University of Idaho. Has worked as a BLM range conservationist for 12 years; ADM Operations, 1 year	Review of land use and biological resources.
Ray Lister Wildlife Biologist	B.S. Wildlife Management, Humboldt State University, 1978. Range technician, 2 years; range conservationist, 7 years; wildlife biologist, 4 years.	Review and input of biological resources.
Robert P. Marchio Realty Specialist	B.S., Forest and Resource Management, University of California at Berkeley. Sixteen years experience with BLM.	Document Review.
Carol Marchio Soil Scientist/ Hydrologist	B.S. Resource Management, University of Wisconsin-Stevens Point 1974. M.S. Land Use Planning - Stevens Point 1976. Fifteen years experience with BLM, half as soil scientist, half as hydrologist.	Document Review.
Bill Baker Wells Resource Area Manager	B.S. Range Management with Wildlife Minor, 1975. M.S. Range Management with Botany Minor, 1977. Both from Washington State University, Pullman, WA. Fifteen years experience with BLM.	Document Review.

Cooperating Federal Agencies:

National Park Service:

Name/Title	Education/Experience	Involvement
Albert J. Hendricks Superintendent Great Basin National Park	B.A. Geography and Geology, (1971), University of Wyoming. Worked with the National Park Service for 20 years.	Served as field coordinator for all aspects of the study as it pertained to the Great Basin Nat'l Park.

Name/Title	Education/Experience	Involvement
David A. Pugh National Park Service Superintendent Hagerman Fossil Bed National Monument and City of Rocks National Reserve.	B.S. Geology, Stanford University (1966). Has 20 years experience with the National Park Service.	Provided resource data on Hagerman Fossil Beds and document review.
Ronald G. Replogle Environmental Protection Specialist	B.S. Landscape Architecture, (1964) Michigan State University. Has worked 15 years with the National Park Service as a Landscape Architect and 10 years as an Environmental Protection Specialist.	Western regional coordinator for the Park Service.
Bart Young Outdoor Recreation Planner	Team Captain for Great Basin National Park Management Plan/EIS. 17 years experience in planning with the Park Service. MA, Environmental Studies, Yale University (1971)	Coordination Review for the draft Great Basin National Park General Management Plan/EIS.

Humboldt National Forest:

Rita Suminski Wildlife Biologist	B.S, Kansas State University, 1974, M.S., New Mexico State University. Three years experience with Humboldt National Forest.	Document review.
Jerry Davis Forest Planner	B.S., University of Idaho, 1964, M.S., University of Idaho, 1966. Three and one-half years experience with Humboldt National Forest.	Document review.
Gary Schaffran Recreation and Lands	B.S., University of Minnesota, 1964. Nine years experience with Humboldt National Forest.	Document review.
Rene P. Dameule Ranger	B.S., Brigham Young University. Five years experience with Humboldt National Forest.	Document review.
Fred Frampton Archaeologist	B.A., N. Arizona University, 1973, M.A., N. Arizona University, 1980. Three and one-half years experience with Humboldt National Forest.	Document review.

Name/Title	Education/Experience	Involvement
W. Toby Rhue Resource Assistant	B.S., Utah State University, 1979. Three and one-half years with Humboldt National Forest.	Document review & SWIP Steering Committee Member.

Bureau of Reclamation:

Name/Title	Education/Experience	Involvement
Lynne MacDonald, Archaeologist	B.S. Education, (1976), Oregon College of Education, M.S. Anthropology, (1982), Oregon State University. Worked 14 years as an Archaeologist, six years with private industry and eight years with the Bureau of Reclamation.	Discussion and consultation with the Idaho State Historical Preservation Office and review of cultural resource documents on the Hunt Site.
Karen E. Megorden, Regional Landscape Architect	B.L.A. University of Oregon, (1978), M.L.A. University of Oregon, (1979). Has worked 14 years as a Landscape Architect for the Bureau of Reclamation.	Coordination with Idaho Power Co. for the Hunt Site and review of documents.
Harold Short Chief of Lands Branch, Bureau of Reclamation	B.S. Agriculture, University of Missouri (1967). 15 years experience in soil survey and land classification and 15 years in lands management.	Coordination of cultural resources of the Hunt Relocation Center Historical site and document review.

Bureau of Indian Affairs:

Name/Title	Education/Experience	Involvement
Ken Esplin Realty Officer	B.S. Business Administration, Southern Utah University. Worked past six years for the Bureau of Indian Affairs as a Realty Officer. Owned and operated a real estate sales and appraisal business for 18 years. 5 years as association manager for the Federal Land Bank System.	Document Review

Name/Title	Education/Experience	Involvement

Utilities:

Idaho Power Company

Name/Title	Education/Experience	Involvement
Jan B. Packwood Vice President, Power Supply	BSEE, 1966, University of Nevada, MBA, 1984, Boise State University. Registered Professional Engineer in Idaho and Nevada. Four years as a commissioned officer in the U.S. Army. Twenty years with IPCo.	Document review.
Michael M. Mann Manager, Power Services	BSEE, University of Idaho, 1971. Twenty years experience with IPCo. Registered Professional Engineer, Idaho.	Document review.
Patrick J. Hasenoehrl SWIP Project Engineer	BSCE, University of Idaho, 1981. Registered Professional Engineer in Idaho. Ten years with IPCo.	Document review.
Larry A. Crowley Manager of Strategic Planning	B.S. Economics, University of Maryland. Four years with the Peace Corp. Seven years with Southeast Colorado Power Assoc. One year with Wisconsin Electric Power Co. Thirteen years with IPCo.	Document review.
Jeff Beaman Public Information Specialist	B.S. Film & Television Production, Montana State University, 1979. Started working for IPCo. in March, 1990.	Document review.
Ralph I. Clements General Manager Generation & Transmission Engineering	BSCE, University of Idaho, 1956. Thirty-five years experience with IPCo.	Document review.
James M. Collingwood General Manager Power Production	Thirty-five years of experience in various operational fields with IPCo.	Document review.
H. C. Durick Manager, Systems Planning	BSEE, 1968, MSEE, 1970, and Degree of Engineer, 1973, University of Florida. Eighteen years with IPCo.	Document review.
Jerry E. Ellsworth High Voltage Transmission Engineer	BSEE, 1989, North Dakota State University. Past experience with Black & Veatch Engineering Consultant. Started working for IPCO in 1991.	Document review.

Name/Title	Education/Experience	Involvement
Michael M. Jacobs Right-of-Way Agent	Twenty-four years experience with IPCo.	Document review.
David W. Meyers Manager, Environ- mental Affairs	BSCE, 1971, MSCE, 1972, Utah State Univer- sity. Registered Professional Engineer in Idaho. Five years with CH2MHILL 3 years of IACI Environmental Affairs. Thirteen years with IPCo.	Document review.
James C. Miller Manager, Power Operations	BSEE, University of Idaho, 1977. Past experiences include electrical engineer, power control supervisor, power operations supervisor. Fifteen years with IPCo.	Document review.
N. V. Porter High Voltage Transmission Engineer	BSEE, 1985, MSEE, 1986, Brigham Young University. Past experience with Pacific Gas & Electric, started working for IPCo in 1989.	Document review.
Thomas W. Prange Engineering Super- visor, Substation Design	BSEE, 1966, MSEE, 1968, Illinois Institute of Technology. Nineteen years experience in substation engineering, design, and construction. Registered Professional Engineer State of Idaho.	Document review.
John P. Prescott Strategic Planning	BSGE, 1981, Idaho State University, MSEE, 1987, University of Idaho, Professional Engineer, State of Idaho. Communications engineering, power control engineering, system operations and strategic planning. Ten years at IPCo.	Document review.
George D. Rosandick SWIP Consultant (Retired)	Nine years experience with Morrison-Knudsen. Thirty-five years with IPCo. Retired in 1984, returned as right-of-way consultant.	Document review.
David G. Russell Supervisor, System Protection & Control	Five years experience with Lockheed Corp. & Sylvania Corp. Joined IPCo in the substation design department. Twenty years experience in system protection.	Document review.
Forrest K. Skaggs Communications Engineering Super visor	BSEE, University of Idaho, 1961. Professional Engineer, State of Idaho. Thirty-one experience with IPCo.	Document review.

Name/Title	Education/Experience	Involvement
James J. Taney Director of Public Information	BA Journalism, 1966, Idaho State University. Eighteen years experience with IPCo.	Document review.
James R. Thompson Attorney	Doctor of Jurisprudence, 1976. University of Idaho. Admitted to practice in State of Idaho. Eleven years experience with IPCo.	Document review.
Darel L. Tracy High Voltage Transmission Engineer	BSCE, 1987, MSCE, 1989, University of Idaho. Past experience in EHV lines for private consultant. Started working for IPCo in 1991.	Document review.
John H. Willmorth Director, Resource Planning	BSEE, 1957, Princeton University, MSEE, 1959, PhD, 1972, University of Washington. Idaho Public Utilities Commission staff, 1975-1981. Ten years experience with IPCo.	Document review.
H. Fred Wright Manager, Contract Development and Administration	A.S., Boise State University, B.S. in Business Management, University of Utah. Nineteen years experience with IPCo.	Document review.
David E. Hagen System Planning Engineer	B.A., University of North Dakota 1972, B.S.E.E., University of Texas - Austin, 1977, MBA Boise State University 1981 MEEE University of Idaho 1989. Registered Professional Engineer in Idaho and Texas. Fourteen years experience with IPCo.	Document review.

Los Angeles Department of Water and Power:

Name/Title	Education/Experience	Involvement
Eric J. Findon Environmental	B.S. Electrical Engineering, University of Pittsburgh, 1985. Masters of Business Administration, Pepperdine University, 1989. Registered Professional Electrical Engineer, State of Calif. Five years experience with LADWP.	Document review.
Thomas M. Halford Transmission Design	B.S. Electrical Engineering, University of Wisconsin, 1969. Registered Professional Electrical Engineer, State of Calif. Twenty-one years experience with LADWP.	Document review.
Charles C. Holloway Environmental	B.S. Electrical Engineering, University of California at Los Angeles, 1989. Two years experience with LADWP.	Document review.

Dames & Moore Study Personnel

Name	Title	Project Involvement
Garlyn Bergdale	Project Director	Partner-in-Charge
Jim Jensen	Project Manager	Management and Administration of project
Greg Gault	Assistant Project Manager	Technical Studies Coordinator
A.E. Rogge, PhD	Director of Cultural Resource Services	Cultural Resources Coordinator
Clyde Woods, PhD	Ethnographer	Native American consultation
Paul Friedman	Historian	Historic Resources
Lori Rhodes	Staff Archaeologist	Prehistoric Resources
Dorothy Larson	Asst. Archaeologist	Prehistoric and Ethnohistoric Resources
Barbara Murphy	Staff Geologist	Earth Resources
Charles Condrat	Hydrologist	Earth Resources
E. Linwood Smith, PhD	Director of Biological Resource Services	Biological Resources Coordinator
Carla Alford	Wildlife Biologist	Wildlife Resources
Sherry Ruther	Wildlife Biologist	Wildlife Resources
Kimberly Otero	Botanist	Botanical Resources
Mark Cochran	Wildlife Biologist	Desert Tortoise consultation
Paul Trenter	Landscape Architect	Land Use/Visual Resources
Brian Strand	Landscape Architect	Land Use/Visual Resources
Chuck Cornwall	Visual Services	Review photo simulation products
Joe Merkel	Landscape Architect	Photo simulation artist

Name	Title	Project Involvement
Martha Rozelle	Director of Public Involvement	Meeting Facilitator
Barbara Lewis	Public Involvement Specialist/Economist	Public participation program and socioeconomics
Randy Palmer	Landscape Architect	Land Use/Visual Resources
Mike Buchenau	Landscape Architect	Land Use/Visual Resources
Beth Defend	Technical Writer	Technical editing
John Qoyawayma	Illustrator	Graphics/illustration
Mitchell Meek	Graphics Manager	Graphics Coordinator
Geoffrey Pool	Environmental Planner	Graphics/illustration
Jim Olsten	Director, GIS Services	Coordinate GIS applications
Dan Moreno	GIS Manager	Designer of GIS models
Luke Heyerdahl	Data Manager	GIS operations/computer graphics
Jackie Rindgen	Data Manager	GIS operations/data management
T. Dan Bracken, PhD	Consultant	Electrical Effects studies
Robert Kavet, PhD	Consultant	Electrical Effects studies

MISSION STATEMENT

"The Bureau of Land Management is responsible for the balanced management of the Public Lands and resources and their various values so that they are considered in a combination that will best serve the needs of the American People. Management is based upon the principles of multiple-use and sustained yield; a combination of uses that takes into account the long term needs of future generations for renewable and non-renewable resources. These resources include recreation, range, timber, minerals, watershed, fish and wildlife, wilderness and natural, scenic, scientific and cultural values."

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